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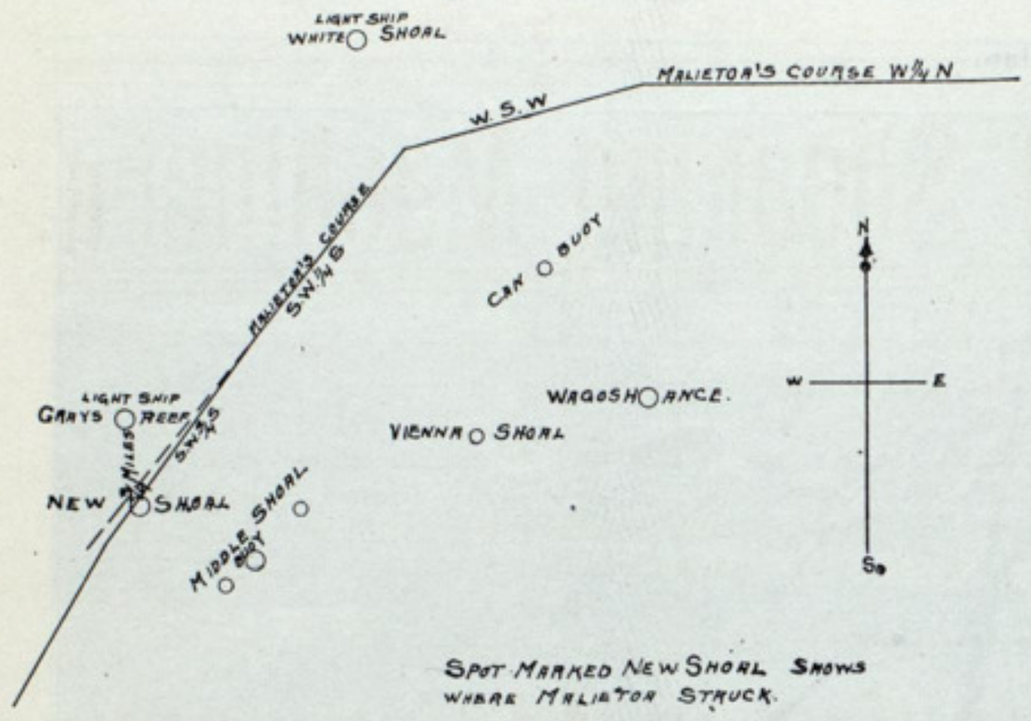
SLOW LIGHT-HOUSE OFFICIALS.

Bottom repairs involving an expense of about $30,000 are being made on the Minnesota line steamer Malietoa and consort Manila as a result of what seems to be (treating the matter mildly) very little interest on the part of United States light-house officials in the matter of marking shoals that are specifically reported to them. Towards the close of last season the Lake Carriers' Association received reports of vessels striking on a spot about three-quarters of a mile to a mile south to S. S. E. of Gray's reef light vessel, Straits of Mackinaw. The light-house officials were immediately informed of the shoal. Again in April last Capt. George P. McKay of Cleveland, who has charge of matters of this kind for the vessel interests, wrote Congressman Burton of Ohio, giving particulars of the shoal, and as nothing had been done towards marking it Mr. Burton was asked to take it up specially with the light-house board. After some fifteen days had elapsed the board reported to Mr. Burton that Com-



mander F. M. Symonds, inspector of the Lake Michigan district, "would, when opportunity permitted, make an examination, and if he found sufficient shoal water to justify the placing of a spar buoy he would place such a buoy to mark the spot temporarily, pending a survey to be made by the U. S. S. Michigan."

Congressman Burton, evidently tired of the red tape methods of the board, as had been the case with the vessel men many times in the past. Five months or more have elapsed with nothing done towards marking the shoal. Now comes the heavy loss on the two vessels of the Minnesota company's fleet, which are operating without insurance, on account of high rates, due to just such accident with steel vessels. Following this forcible reminder of the great loss that results from delay in such matters the board announces that "the Michigan is at present surveying in this vicinity and the reported shoal spot will be buoyed when located."

A diagram presented herewith shows the place where the Minnesota company's vessels struck, as well as it can be located at present.

DEATH OF ARTHUR SEWALL.

The Hon. Arthur Sewall, Democratic candidate for vice-president in 1896, died at his summer home at Small Point, near Bath, Me., Wednesday. Arthur Sewall was born in November, 1835, in Bath, Me. He was the third son of William D. and Rachel T. Sewall. His father was a grandson of Col. Dummer Sewall of the revolutionary army. Mr. Sewall was educated in the common schools of Bath, and entered the employment of his father's firm, which then conducted one of the largest ship building enterprises in the country.

Mr. Sewall formed a partnership with his brother, Edward, in 1854 in the establishment of a ship building firm, of which he remained the leading spirit until he died, the firm being known as Arthur Sewall & Co. Although Mr. Sewall was reputed to be a millionaire, he was simple in his tastes, and while his home was richly fitted up with everything that money could purchase, he was always opposed to display of any character and was unostentatious to a degree. Mr. Sewall was a Tilden Democrat. He never held public office, but was a member of the Democratic national committee for many years and was looked upon as a power in Democratic politics in New England. In addition to his pride in ship building he took a large interest in railroads. He was formerly president of the Maine Central railroad and recently president of a bank in Bath.

After Mr. Sewall assumed the management of the large ship building plant which had been developed by his father and grandfather, it grew to such an extent that the ships of the firm could be seen in almost every port in the world. No family in America has done more for the merchant marine for almost a century than the Sewall family, and the collection of models of ships possessed by the family is superior to anything of the kind in the country. Mr. Sewall constructed and launched in 1894 the Dirigo, the first steel sailing ship built in this country, and also built several three and four-masted schooners for the coal, ice and lumber trade. Mr. Sewall's nomination for vice-president in 1896 on the ticket with Bryan came to him unsolicited and as a surprise. He attended the convention which placed him in nomination, little expecting that he would be the candidate. He was elected a delegate-at-large to the recent national Democratic convention. Mr. Sewall leaves a widow and two sons, Harold M. and William D. Sewall.

SAULT RIVER RULES—PROPOSED MODIFICATION.

As it is more than probable that the question of modification—probably in a very limited way, however—of the navigation rules of the St. Mary's river will again be brought up at the next annual meeting of the Lake Carriers' Association, Capt. George P. McKay of Cleveland has decided to secure the views of different interests on the subject before the meeting. He has begun the work by writing Capt. A. B. Davis of the revenue cutter service, telling him there are some vessel masters who are of the opinion that a speed limit is not now really necessary in any part of the river, in view of the well defined regulation as to vessels meeting and passing one another. Capt. Davis says:

"As I understand you, no change in these rules will be asked this season, and at present you desire my views simply for the purpose of taking the matter up at the annual meeting of the Lake Carriers' Association in January next. In my opinion the speed limit should not be eliminated altogether. The speed of 9 miles an hour should not be increased through the cut at Johnston point (Sailors Encampment) or through the island cut (upper part of Little Rapid cut). At these points there are many small boats containing women and children. The swell from a steamer going at a high rate of speed might capsize these boats, drowning the occupants. Neither would I deem an excessively high rate of speed prudent in any of the narrow parts of the river, but would recommend amending the rules as follows:

"No speed limit from the entrance of St. Mary's river to Evern's point. Between that point and the north entrance of the 'Dark Hole' the 9-mile rate should still be maintained. From the north entrance of the 'Dark Hole' through Little Mud lake, Middle Neebish channel, a speed of 12 statute miles over the ground could be safely granted to the red can buoy at the turn leading into Little Rapid cut, with the exception of Hay lake, where the present rules allow any rate of speed. At the red can buoy slacken down to the 9-mile limit. As regards approaching and passing vessels the rules should stand as they now are. Where the speed of 9 miles an hour would still be in force under these modifications the distances are so short it would cause little delay.

"In your letter you make inquiry as to whether it would be advisable to allow one vessel to pass another moving down the river in the same direction in Little Mud lake, the passing vessel to go out of the channel to the westward of the buoy. I doubt if such a change would benefit any vessel drawing over 12 ft. of water, as the depth would not permit of passage; on the other hand, it would not be a good thing to allow a large vessel, even though her draught permitted it, to pass outside of the channel, as a reckless captain might take the chance of getting by before reaching the 'Dark Hole.' If he did not succeed the vessels would come together and a blocked channel would probably result. The privilege might be given any vessel of passing another going in the same direction bound up, after passing out of the Middle Neebish channel into the cut at Lower Hay lake, provided this could be done by going to the westward of the black buoys."

PRODUCTION OF MANGANESE ORE.

The annual report of the United States geological survey, compiled by John Birkinbine, shows that less manganese ore was mined in the United States last year than for several years past. The total was 9,935 tons. The importations, however, were largely in excess of 1898. The general treasury decision classifies ores as manganese which contain 50 per cent. or over of manganese and not over 10 per cent. of iron. This decision was later amended to include certain ore containing less than 50 per cent. of manganese when the ore contained therein was less than 3 per cent. The total production of manganese ores in the United States in 1899 was 9,935 tons, valued at $82,278, or $8.28 per ton. Nine states contributed to the total. Virginia, after occupying a subordinate position for seven years, again heads the list of states, with a production of 6,228 tons, or 62.69 per cent. of the total of the country, followed by Georgia. Arkansas has shown a marked decline in production. Alabama has ceased to mine any manganese ore, but Missouri has been added to the list. North Carolina, Pennsylvania and West Virginia have resumed as small contributors. Colorado produces ores which in this report are classed as manganiferous iron ores, but locally they are considered as ores of manganese, as they contain from 20 to 43 per cent. of this material. While there has been a falling off in the amount of manganese mined in 1889 of 6,022 tons, or 37.74 per cent., from the product of 1898, the average value has increased over $8.10 per ton in 1898 to $8.28 per ton in 1899, a gain of 18 cents per ton, or 2.22 per cent.

The imports of manganese ores in 1899 were 188,349 tons, an increase of 73,464 long tons, or 64 per cent., over the quantity received in 1898, owing principally to augmented shipments from Russia, Brazil, Chile and British East Indies and the resumption of commercial relations with Cuba. The average value of the manganese ores imported in 1899 was $8.41 per ton, as against $7.24 per ton in 1898. The high valuation placed by the customs officers on the ores imported from the United Kingdom, Nova Scotia, New Brunswick, etc., and Germany, is probably due to other chemical components than manganese. The following figures show the amount and value by countries of the manganese ores imported during 1899: Russia, 73,337 long tons, value $598,644; Brazil, 28,115 tons, value $299,877; British East Indies, 17,950 tons, value $54,471; Chile, 17,576 tons, value $111,726; Cuba, 16,359 tons, value $221,785; Colombia, 8,900 tons, value $82,489; Turkey in Europe, 8,310 tons, value $61,241; Turkey in Asia, 5,782 tons, value $46,822; Japan, 4,492 tons, value $31,657; Greece, 3,030 tons, value $10,526; France, 2,953 tons, value $21,080; Germany, 1,274 tons, value $34,927; the United Kingdom, 134 tons, value $6,697; Nova Scotia, New Brunswick, etc., 78 tons, value $2,586. Total, 188,349 tons, value $1,584,528.

The American Bridge Co., Pittsburg, Pa., is the lowest bidder for the construction of a gunner's workshop at the Washington navy yard.

DEUTSCHLAND IS SURELY THE QUEEN.

The titanic Deutschland of the Hamburg-American line created two more records on the trip she finished Saturday last from Cherbourg. She was abreast of the French port at 9:55 on Sunday night, Aug. 26, and she passed the Sandy Hook lightship at 5:24 o'clock Saturday morning, Sept. 1. Her time was 5 days 12 hours and 29 minutes, over a course of 3,050 knots, at an average hourly speed of 23.02 knots. On the nautical day ending at noon on Friday she reeled off 584 knots, thus beating by four knots the best day's performance of the North German Lloyd flyer, Kaiser Wilhelm der Grosse. The Deutschland's hourly average on this wonderful day's run was about 23.90 knots. If she had been able to maintain this rate for the whole voyage she would have made the trip in 5 days and about 7 hours. Her daily runs were 337, 566, 570, 570, 584, and to the Sandy Hook lightship, 423 knots. She had one day of rough weather and much fog off the Banks, which cost her a few hours. She burned 560 tons of coal a day to accomplish her previous westward performance and beat the best day's run of the Kaiser Wilhelm der Grosse. That is only about ten more tons than the furnaces of the Cunarders Lucania and Campania consume, and they are more than a knot an hour behind the record of the great Hamburg ship.

The maiden voyage of the Deutschland was from Plymouth and up to that time was the fastest run across the Atlantic to the westward. Her average speed was 22.42 knots and her time was 5 days 16 hours and 15 minutes.

On her last trip to the eastward the Deutschland did half a knot better than she did on this voyage. Her time was 5 days 11 hours and 45 minutes and her average speed was 23.32 knots. She had ideal weather except for a day. With perfect weather conditions she could doubtless carve off 4 knots even from her eastward record. The North German Lloyd line hopes that the biggest and most powerfully engined of the two giants it is building may knock out the Deutschland. The contest for ocean supremacy in speed will probably be confined to two great German lines, as the Cunard, the White Star and the American lines have practically decided against the building of big ships of enormous power on the ground that they are too expensive.

The engineers of the Deutschland believe that the ship has "found herself," and that if the seas continue smooth on her return trip, which began at 11 o'clock on Tuesday morning last, she will clip an hour or so off the eastward record. The Kaiser Wilhelm der Grosse, which approaches nearest the Deutschland in speed and power, sailed on the same day and an hour earlier than the record holder. Another ocean race is therefore now in progress.

ST. PAUL BEATS THE CAMPANIA.

The American line steamer St. Paul arrived last Friday night after a quick passage of 6 days, 7 hours and 6 minutes. This time is the best made by the St. Paul between New York and Cherbourg, and beats the best time of each of the big fleets of ocean greyhounds plying between Cherbourg and New York with the one exception of the Kaiser Wilhelm der Grosse.

After the St. Paul reached her dock, which was at 11 o'clock Friday night, the passengers told of the great race the liner made with the Cunarder Campania. They said the interest in the race was so great that nearly all the passengers remained awake Thursday night and until dawn Friday morning. On Thursday evening, before nightfall, the Campania was sighted about 500 miles out and was then ahead of the St. Paul by about four miles. A race was inevitable.

Aboard of the St. Paul was President Clement A. Griscom of the line, and the crew nerved themselves to get all the speed out of the vessel that she was capable of. The St. Paul made a burst of speed and steadily forged ahead. The nerves of every passenger and of the crew were keyed to the straining point. The passengers amused themselves by making pools on the result. The interest in the race continued while the vessels were in sight of one another, but before dawn the St. Paul was so far ahead that the Campania could not be seen. The St. Paul was at her dock when the Campania anchored at quarantine for the night.

COULD NOT LOCATE THE HOLLAND.

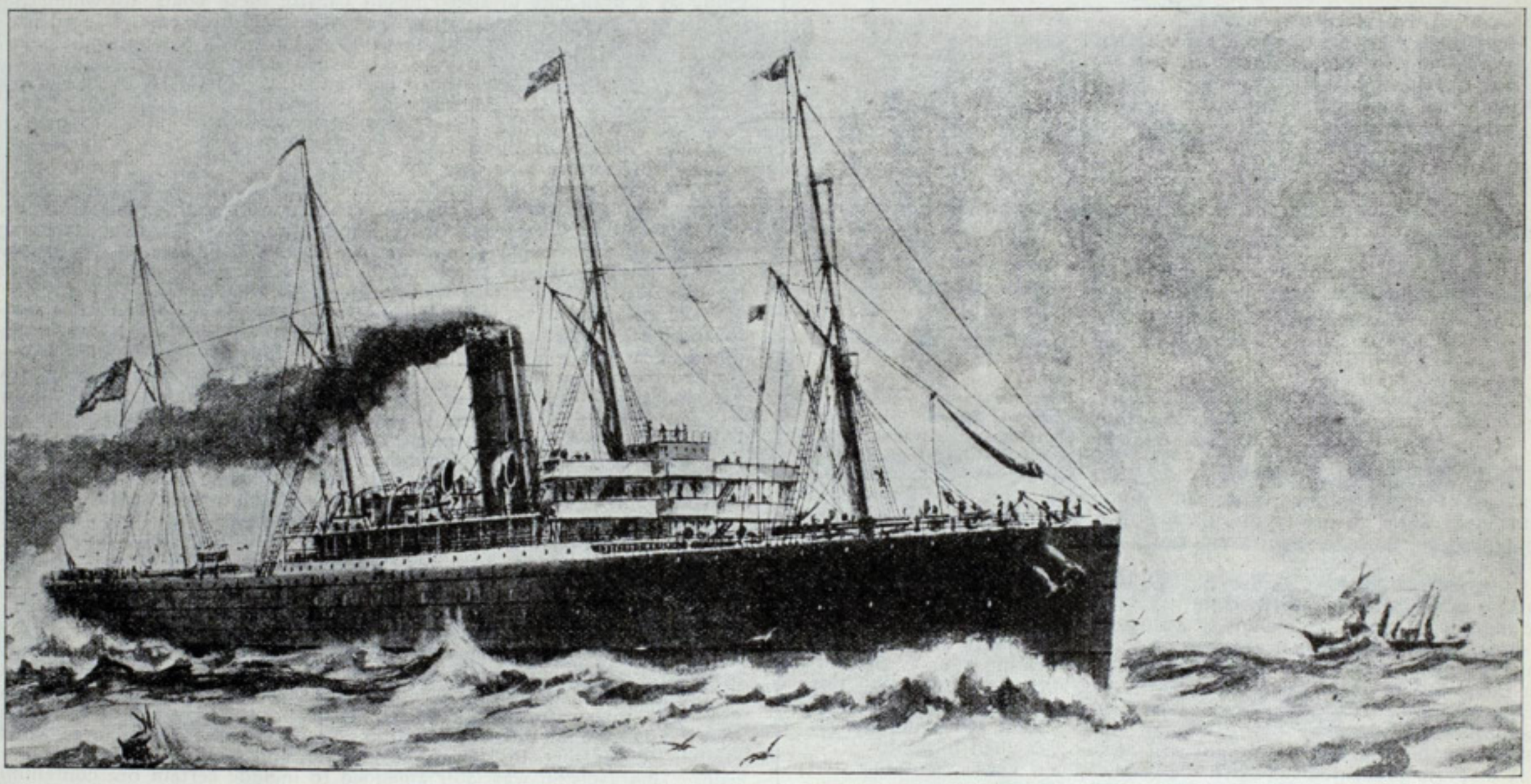
One of the most important tests that have been made at the naval torpedo station, Newport, R. I., since its establishment, took place last week. It was a searchlight test upon a night attack by the submarine torpedo boat Holland, and it proved that it will take more than the powerful searchlight to pick up the Holland after dark and that she could run up on and sink any war vessel she might wish. It was also the first time that the Holland has ever been exclusively operated by a naval crew. It was in charge of Lieut. Caldwell, who was Admiral Dewey's secretary. The men operated the boat in a manner which proves that others besides the builders are capable of handling her.

The attack was made on the United States tug Leyden, which it attached to the station. She was in charge of Lieut. Com. Hodgson. The Leyden went out shortly after 8 o'clock and took up a position at the entrance of the bay and then the attack began. Not only did the Holland figure in the proceedings, but the torpedo boats Rodgers and Morris were also brought into use. After the attacking boats got well under way the Leyden turned on her searchlight, and at the same time the powerful light at the station was thrown on the bay. The Holland was carrying side lights, and while these were burning she was picked up, but it was no easy matter. The torpedo boats, however, were picked up with ease and could not at any time get near enough to torpedo the Leyden. The lights of the Holland were then put out and the most interesting part of the test began. The lights shot across the surface of the water, but try as they would it was impossible to find the boat, which was running awash. For half an hour the men on the Leyden watched for the Holland, but no signs of her could be seen. She was last seen in the line of the ferry boat, and some fears were expressed for her safety, but finally the lights were put out and the Leyden returned to the torpedo station. After the tug was docked a look was made at the Holland's berth and she was found tied up for the night.

The crew of the Holland say that after putting out the side lights they came for the Leyden in the rays of her searchlight until within about 150 feet, near enough to use a torpedo with deadly effect. Then she was headed across the bay and went equally as near the flagship New York. Then she changed her course and headed for Newport, following in the wake of the Jamestown ferry boat. The crew said that they had thought several times that they had been picked up, and were surprised when told that such was not the case. The boat was not fully submerged, and the deck was not under water at any time. Further tests of this kind will be made. There will be an attack on the vessels of the North Atlantic squadron when they return next month.

The New York Tribune is authority for the statement that the construction of a fleet of large ocean steamers for carrying both freight and passengers by the New York Central railroad has been under discussion of late. This improvement has been projected in connection with the improvements of the terminal at Weehawken and the expenditures of between $3,000,000 and $4,000,000 in enlarging the yards there, building new piers and tracks and a general increase of freight capacity.

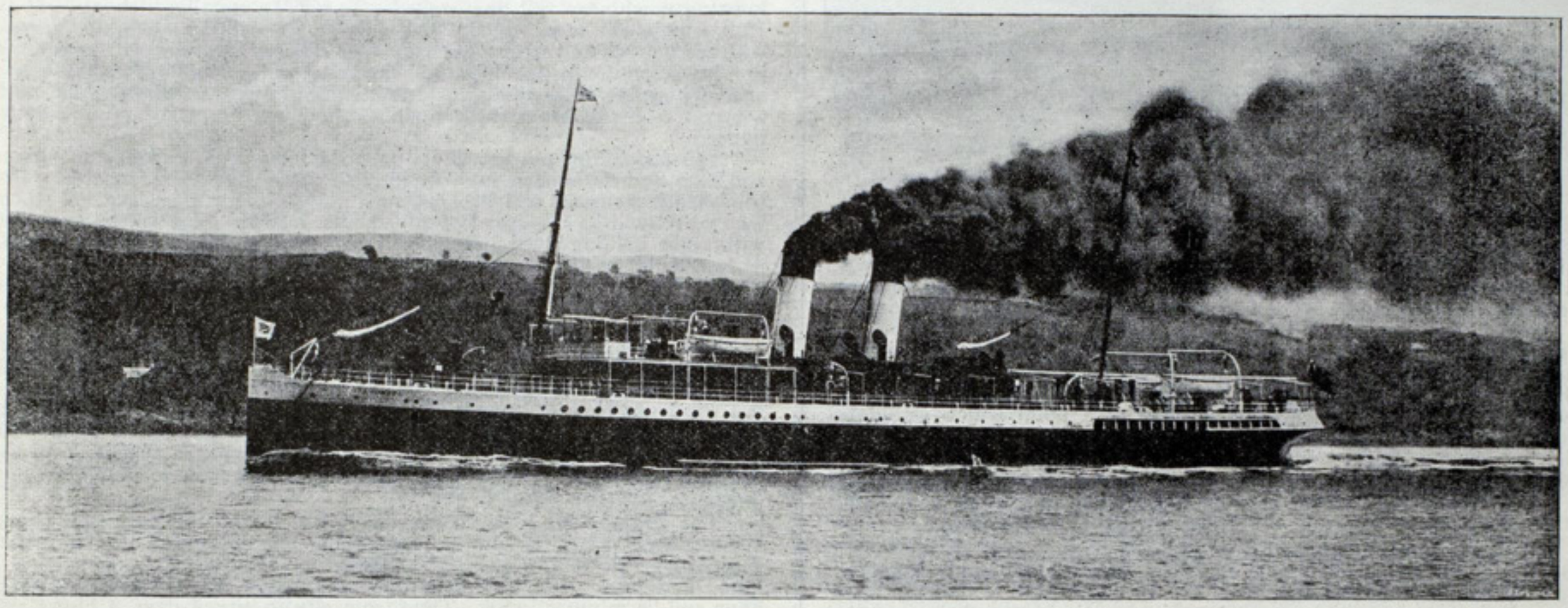
The Canadian.



THE NEW STEAMER LATELY LAUNCHED AT WORKS OF HAWTHORNE, LESLIE & CO., IN ENGLAND, FOR THE AMERICAN SERVICE OF FREDERICK LEYLAND & CO.

DIEPPE CHANNEL STEAMER ARUNDEL.

The new screw steamer Arundel has been placed on the channel route from Newhaven to Dieppe by the London, Brighton & South Coast Railway Co. The steamer was built by William Denny & Brothers of Dumbarton. Newhaven, 57 miles from London, is the port adopted for the company's service on the English side, and Dieppe on the French coast, where the trains of the Western railway of France come alongside the steamer. The Dieppe line to Paris is one of the most picturesque, and, moreover, it offers the most direct route to Brittany. The sea voyage is 64 nautical miles, and each successive vessel put on the station by the London, Brighton & South Coast Railway has marked an improvement upon the preceding steamer, not only in speed but in seaworthiness and traveling comforts, and now the voyage is made in about three hours. The Brighton Railway Co.'s later ships, of the twin screw type, have come from the Dumbarton firm who have had a long series of successes with channel steamers. This is in part due to the fact that with such steamers there are often limiting conditions as to length, breadth or draught, owing to peculiarities of dock or harbor accommodation; and in such cases the forms and lines of a ship are specially important elements in design, not only with a view of minimizing draught for a given weight carried but of reducing the power for a given speed and consequently the coal consumed on the trip. The Arundel is typical of this class of which Messrs. Denny have built a large number. The most of these vessels are from 19 to 22 knots speed, and the limitations involved problems of design in the direction indicated. For the London & Northwestern Railway Co. they have built six vessels, principally for the Holyhead & North Wall route, and for the London, Brighton & South Coast Railway Co. the same number of fast vessels have been constructed. The Arundel is in many respects similar to the Sussex, built in 1896, and still a favorite vessel in the channel service. The molded dimensions are 277 ft. by 34 ft. by 22 ft., the gross tonnage being 1,000 tons. Externally she presents a very handsome appearance. She has a straight stem and elliptical stern, two pole masts and two funnels. The rate of speed being high, the lines of the vessel are very fine, and with her graceful sheer the steamer is one of the handsomest that has been turned out from the builders' works. The promenade deck extends the whole length of the vessel. The vessel has all the conveniences of a deep sea liner, including staterooms, dining and smoking and ladies' cabins. She is subdivided by eleven watertight bulkheads without doors, into compartments. She has a full board of trade outfit of life saving appliances, including 1,100 life belts, rafts, and four boats to accommodate 320 passengers. The vessel is equipped with two sets of triple expansion engines, balanced on the Yarrow-Schlick-Tweedy system. There was complete absence of vibration when the ship was steaming at 21 knots per hour on her trial trip. Each set has four cylinders, but working with three stages of expansion; the high pressure being 23½ in. in diameter; intermediate, 35½ in.; and two low pressure cylinders, each 37½ in. in diameter, all working with a stroke of 2 ft. 3 in. The arrangement in the ship from the forward end is: low pressure, high pressure, intermediate pressure and low pressure. The high pressure and intermediate pressure cylinders have piston valves, and the two low pressure have slide valves. The air pumps, which are 22 in. in diameter, are worked with an 11-in. stroke off one of the low pressure cylinder crossheads. The condensers are separate and fitted in the wings. There are two Worthington bilge pumps, each having 7½ in. steam and 8 in. water cylinders by 10-in. stroke. Steam is supplied at a working pressure of 160 lbs. per sq. in. by two large double ended Scotch boilers working under forced draft on the closed stoke hold principle, the air being supplied by four fans driven by Chandler enclosed engines.



TWIN-SCREW STEAMER ARUNDEL FOR THE NEWHAVEN AND DIEPPE CHANNEL SERVICE.
Constructed by Messrs. William Denny & Brothers, Dumbarton; Engined by Messrs. Denny & Co., Dumbarton.

Capt. Patrick J. Larkin, for many years one of the best known captains on the lakes and later known as head of the contracting firm of Larkin, Connolly & Connolly, died at St. Catherines, Ont., Sept. 1. Among the public works on the construction of which Mr. Larkin was engaged during his career as a contractor were the Welland canal, the graving dock and harbor works of Quebec, the graving dock at Esquimault and the St. Lawrence canal at Iroquois.

As a result of negotiations it is announced Elder-Dempster & Co. will acquire a fleet of twenty-five steamships belonging to the British and African Steam Navigation Co., at a cost of $4,500,000.

A NEW PERMANENT SHIPPING LINE.

The circular issued by the American-Hawaiian Steamship Co. announces that it will begin its service to Pacific coast ports and Hawaiian islands via the Straits of Magellan with the dispatching of the steamship American on Sept. 1. While this announcement in itself contains only the bare information that a new steamship service on the western coast of this country and to the Hawaiian islands has been established, it brings news of much importance to the general trade. Besides the American there will be five other boats added to the line, which will make it one of the most important in the shipping trade among the ports mentioned. First, because its steamers are much larger than the ordinary boats engaged in the trade, and second, because it establishes a permanent shipping line from New York to the Pacific coast ports and the Hawaiian islands. The six boats to engage in the service are the American, Hawaiian, Oregonian, Californian, Alaskan and Arizonian. The Californian was launched on May 12, and has been engaged in the transport service of the United States between San Francisco and Honolulu. The American, which will make the initial trip Sept. 1, was launched July 14. The boat was built at Roach's ship yard, Chester, Pa. She is 435 ft. over all, 56 ft. beam, 33 ft. deep, and will carry 8,500 tons, dead weight, at a maximum speed of about 11 knots. Her sister boats are the Hawaiian and the Oregonian. These three are single screw steamers, built with what is known as the well deck, and are the largest of their kind in the world. The Hawaiian will be ready for launching about the last of September, and the Oregonian will be taken from the stocks about the latter part of November. Both of these ships are being built at Roach's ship yard. The Alaskan and Arizonian are larger than the other boats, having a capacity of 12,000 tons with twin screws, quadruple expansion engines and shelter decks. They are rated to be the highest type of full-powered American-built cargo steamers extant. The Alaskan and Arizonian will not be completed before next year. The former will be launched probably in the spring and the latter early in the fall. Another important feature of the line is that its ships will be dispatched monthly. It will enter strongly into competition with the many other lines on the Pacific coast, of which the following may be named: Grace & Co., Pacific Steamship Navigation Co., Kosmos lines and the Hamburg-American line. The addition of the new service of the American-Hawaiian Steamship Co. will be of great benefit to the trade on the western coast, in that it will tend to cause a material reduction in tariffs, which at present is the all-absorbing topic of discussion with merchants on the western coast. The new line will also touch some ports of Chili and may possibly develop a trade among the Western South American ports. The general agents for the company in New York are Flint, Dearborn & Co., at 11 Broadway.

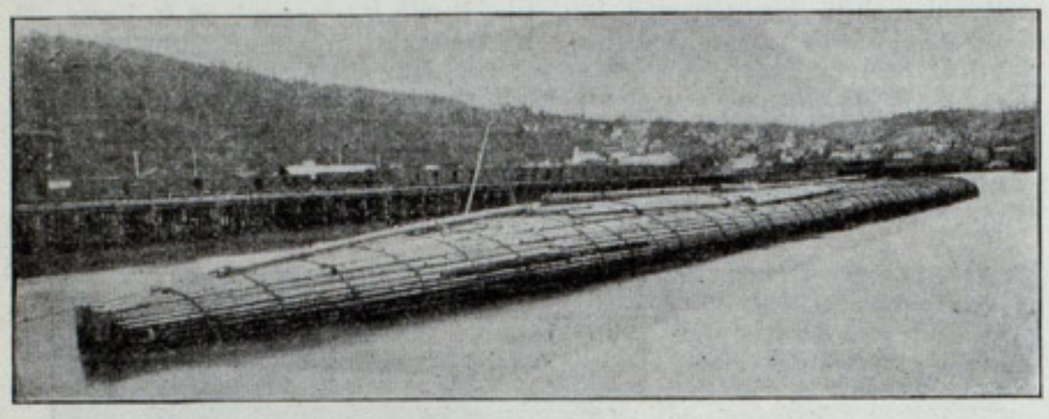
OUR EXPORT OF COAL.

Exports of coal from the United States during the year 1900 are likely to reach $20,000,000 in value, against $10,000,000 in 1896 and $6,000,000 in 1890. The figures of the treasury bureau of statistics show that the exports of coal from the United States during the seven months ending with July, 1900, are 50 per cent. in excess of those during the corresponding months of last year and double those of the corresponding months of 1898. In the seven months ending with July 1898, the exports of coal from the United States were 2,375,451 tons; in the same months of 1899 they were 3,006,082 tons, and in the corresponding months of 1900 they were 4,601,755 tons. During the period from 1890 to 1900 the exportation of coal from the United States has quadrupled, but the principal growth has been in the years 1898, 1899 and 1900. While this growth is observable in the exports to all parts of the world, it is especially marked with reference to our exports to the American countries. To British North America, the exports in the seven months of 1898 were 1,788,398 tons and in the seven months of 1900, 3,253,803 tons. To Mexico, the exports in the seven months of 1898 were 243,938 tons, and in the corresponding months of 1900, 415,834 tons. To Cuba the exports have more than doubled, being in the seven months of 1898, 114,655 tons and in the seven months of 1900, 241,712 tons; while to Porto Rico the exports increased from 2,621 tons in the seven months of 1898 to 15,313 tons in seven months of 1900. To the Hawaiian islands, the exports of the seven months of 1899 were 10,381 tons, and in the corresponding months of 1900, 21,001 tons, thus more than doubling in a single year. To the Philippine islands the exports in the seven months of 1898 were 4,810 tons, and in the seven months of 1900, 41,068 tons, or eight times as much in 1900 as in 1898.

LUMBER RAFTS ON THE COLUMBIA RIVER.

The states of Oregon and Washington have seen a remarkable development of the method of transporting lumber to California by sea in the form of large built up rafts, and although the increase in the price of timber of the kind which has been shipped by this method makes it likely that no more rafts of the kind will be built, this unique and daring means of transportation will always remain as one of the curiosities of the lumber trade of the Pacific coast. Accompanying are presented illustrations of the last of these large rafts to be constructed. Like several of its predecessors, it was built at the little town Stella, which is located on the Washington shore of the great Columbia river, and about twenty miles from its mouth. The accompanying illustrations are of particular interest, as showing the means by which the huge rafts are built up to the desired cigar shape, prior to their launching.

This particular raft was some 400 ft. in length and over 100 ft. in circumference. It was built up of fir piles, which varied from 80 to 111



RAFT OF PILES ON THE COLUMBIA RIVER READY FOR TOWING TO SAN FRANCISCO.
Length, 400 feet; circumference, 100 feet; contents, 6,000,000 feet board measure.
From the Scientific American.

feet in length. It is readily perceived that to form a strong and flexible structure of this length out of such relatively short pieces, and mold it to a true cigar shape, would be an impossible task, unless a permanent form of cradle were first built in which to contain it during the process of building it to form. The cradle, as will be seen from our illustrations, is not unlike the skeleton of a large ship in the days of wooden ship building. It is constructed with a double keel and a series of heavy frames of twelve by twelve timbers with heavy knee bracing between the floor timbers and the verticals at a point which would be known as the bilge in a ship. The keel is constructed in two sections, which are held together by massive locks or clamps, to maintain the cradle in position while the raft is being formed. The piles of the raft are laid to break joint as far as possible, the abutting ends of one line of the piles coming opposite the center of the piles adjoining.

When the raft is completed it is wrapped around several times with massive cable chains, which hold the mass firmly but flexibly together. After the raft is launched the locks are sprung open by hauling upon ropes which are securely connected to them and the two halves of the cradle, thus unlocked, float apart, leaving the raft free to be towed away. The tug's hawser for towing is made fast to a very heavy chain, which runs through the entire length of the raft. This towing chain is made fast by transverse chains to each of the binding chains, which run around

CRADLE IN WHICH RAFT IS BUILT UP.

the circumference of the raft. The effect of this arrangement is that when the strain of towing comes upon the central chain the binding chains are also tightened, and, consequently, when the raft is in a sea-way the greater the strain upon the hawser the tighter is the clamping effect of the binding chains. Although the earlier rafts frequently came to grief those which have been constructed of late years on the system, as outlined above, have proved themselves well able to stand the stress of an ocean trip.

The distance from the mouth of the Columbia river to San Francisco is about 700 miles, and under ordinary conditions of weather one of the powerful tugs which are detailed for the work of towing will take a raft of this kind from the Columbia bar to the Golden Gate, San Francisco, in about twelve days. The raft, which is herewith illustrated, contains about 500,000 linear feet of timber, or say about 6,000,000 board feet, a sufficient quantity of timber to load a half dozen vessels each of 1,000 tons burden.—Scientific American.

ANOTHER AMERICAN "TRAMP" STEAMER.

Reference was made in the last issue of the Review to the new steel steamship which the Maryland Steel Co., Sparrow's Point, Md., is to build for the Boston Towboat Co. The vessel will be a duplicate of the Hyades and is to be completed within thirteen months. The new vessel will be a cargo-carrying vessel of the tramp class, and with its sister ships will be among the first of that type to sail under the American flag. The majority of "tramp" steamers afloat sail under the British flag. The Hyades has been recently chartered to carry a cargo from New York to San Francisco. The new steamship will be of steel construction and will be of 3,753 tons gross and 2,030 tons net, with a carrying capacity of 5,300 tons dead weight. She will be 350 ft. in length over all, 330.6 ft. in length between perpendiculars; beam molded, 47 ft.; sheer, forward, 8 ft., aft, 3 ft. The hull will be built for a 20-year rating, according to the highest standards of the United States register for that period.

There will be seven full bulkheads, six of which will be water-tight and extending to the upper deck. There will be two steel decks one-half inch thick extending fore and aft, a poop deck 50 ft. long, a bridge deck 80 ft. long, and a forecastle deck 50 ft. long, all of inch thick steel.

A water bottom, 40 in. deep, will run from the collision bulkhead forward to the stern bulkhead aft, givng a capacity for a water ballast of 750 tons, in addition to 353 tons in the forward and after peak tanks. These will be operated by a horizontal duplex ballast pump equipped with cylinders 7½ in. in diameter and water cylinders 10¼ in. in diameter, and will have a 10-in. stroke. The steamer will be equipped with seven cargo hatches, the covers being of steel and wood. A complete outfit of deck-hoisting machinery will be installed. Two 20-ft. metallic lifeboats and an 18-ft. dingy will be provided. The new vessel will be schooner rigged with steel masts and steel topmasts. The officers' quarters will be located in a house on the bridge deck, and the galley will extend across the house near the engine room skylight. A steel pilot house and chart room, with a private stairway from the captain's room, will be placed on the deck-house.

The propelling power will be furnished by triple expansion engines and two Scotch boilers, each fitted with three Morrison furnaces. The total heating surface will be 4,000 sq. ft., and the grate surface 146 sq. ft. The vessel will have a speed of 10¼ knots, loaded. She will be equipped with tanks holding 6,000 gallons of fresh water, and will consume 20 tons of coal daily.

PROTEUS IS A FLYER.

The steamship Proteus, Capt. E. V. Gager, of the Cromwell line, between New York and New Orleans, has been doing some very fine work since she began her career on this old established line. Her fourth and last trip from New Orleans to New York, brought her within 27 minutes of the right of a record-breaker which has been and is yet held by El Rio, sold to the government during the Spanish war, Capt. R. B. Quick, of the Morgan line (4 days 4 hours). The Proteus was built by the Maryland Steel Co., Sparrow's Point, Md.

The Proteus left New Orleans at 9:15 a. m., by the Cathedral clock, Wednesday, August 22, and arrived off her pier in New York city, Sunday, August 26, at 3:05 p. m. The difference in time to be deducted is 1 hour, 4 minutes; delay at quarantine, New York, 20 minutes, making 1 hour and 24 minutes in all. Time from city to city, 4 days, 4 hours and 26 minutes. Time from bar to bar, 3 days, 21 hours and 10 minutes. The Proteus' day's runs were as follows: First day to Thursday noon, 429 miles; second day to Friday noon, 412 miles; third day to Saturday noon. 442 miles; fourth day to Sunday 3:05 p. m., 435 miles. Distance sailed, 1,718 miles. Average speed, 17.13 nautical miles per hour.

Following is an official record of the fastest trips made from New Orleans to New York (from bar to bar) from July, 1893, to August 26, 1900:

		D.	H.	M.
Creole, Capt. E. V. Gager	July, 1897	4	2	25
El Sol, Capt. Geo. W. Mason	Aug., 1893	4	2	21
El Cid, Capt. J. W. Hawthorne	Aug., 1893	4	2	15
El Norte, Capt. J. W. Hawthorne	April, 1896	4	2	10
El Rio, Capt. R. B. Quick	July, 1897	3	23	37
Proteus, Capt. E. V. Gager	Aug., 1900	3	21	10
El Rio, Capt. R. B. Quick	Aug., 1897	3	20	37

A 20,500-MILE VOYAGE.

The Baltimore Sun says that a trip of 20,500 miles was completed lately when the turret steamer Laureldene, Capt. Tippett, dropped anchor in that harbor. On January 9 the Laureldene sailed from Baltimore for New York with part cargo of general merchandise. From New York she steamed in order to Capetown, Port Natal, Calcutta, Colombo, Aden, Port Said, Algiers, St. Michael's, New York and Baltimore. She arrived in New York on August 3. At Calcutta the Laureldene took on board two lions and two leopards on United States government account. Over twenty live goats were sent with the ship to be used in feeding the wild animals. When within a short steaming of Malta, Chief Engineer William Clark was taken ill. Capt. Tippett ordered all steam on that he might reach Malta, but before the Laureldene got to quarantine Mr. Clark died. Capt. Tippett was refused a burial place for the dead man ashore, and he had to go to sea to bury him.

A course of instruction by mail in chemistry is announced by the International Correspondence Schools, Scranton, Pa. The course includes mathematics, physics, theoretical, inorganic and organic chemistry, qualitative and quantitative analysis. George Herman Dimpfel, Ph. D., who is in charge of the chemistry course, is a graduate of the University of Leipsic, Germany, and also studied in the Universities of Strassburg and Heidelberg. Later he was an instructor in the latter institution, but was induced to take up commercial work, and after an extended experience in European cities he came to this country and is now principal of the school of chemistry.

The Louisville & Evansville Mail Co. has placed a contract with the Howards at Jeffersonville, Ind., for the building of a handsome side-wheel steamer to be used in the Louisville and Evansville trade. The boat is to be 225 ft. long, and to be built with a view of speed as well as freight carrying. It is to take the place of the E. G. Ragor.

PRAISE FOR THE ALABAMA AND HER ENGINES.

Capt. Vladimir Behr, commander of the imperial Russian cruiser Variag, was one of the party who witnessed the trial trip of the Alabama over the Cape Ann course. Discussing it he said:

"I believe that in battle she would be the equal of even the 15,000-ton battleship of the British navy," said he. "Her performance was admirable throughout. It was to be expected that she would exceed her contract requirement in point of speed, for the Cramp ships always do that, even since the bonus for extra speed was rescinded. Her engines worked very softly and there was no vibration of the ship. One feature of her performance that is worthy of comment are the turns she made. I do not remember ever to have seen so large a ship turn at full speed, both engines ahead, in so small a radius. There is no doubt that the Alabama is an exceptionally powerful battleship."

In answer to a question as to the severity of the test, as compared with that imposed by the Russian government, Capt. Behr said: "Of course our test is more severe, and I naturally prefer it. After standardizing the screw we make twelve hours at full speed, whereas the American battleships are required to maintain their speed for but four hours. For one hour of the time we weigh the coal used to ascertain how many pounds are consumed to each indicated horse power. We also make a 24 hours' trial at about 10 knots speed to calculate the steaming radius of the ship at that speed. In the 12 hours' speed test at sea we are not allowed to repair engines nor to clean the boilers.

"While I do not look on the test of the American battleship as so searching as that given ours, there is no question that the Alabama is a good ship. In my judgment she could, under our method of testing, meet the requirements. While she might not make 17 knots, as in this trial, she would, I should say, be able to make 16½ knots, though that is but a conjecture. It should be remembered, too, that all the ships that have been built for this government and under the same requirements, have proved to be thoroughly good ships. I have not a bit of doubt that the Alabama could duplicate the famous feat of the Oregon.

"I would not say that I think she is the most powerful battleship this government has, for, of course, both the Kearsarge and the Kentucky are very powerful. But I do say that in battle I should rather command the Alabama than either. Why? Well, simply because I do not fancy the double turrets. If anything should happen to a turret on the Kearsarge or the Kentucky four of the most powerful guns would be out of action at once. Perhaps it is partly because I am used to ships of the single turret and not used to the double turrets. But I prefer the Alabama type."

WHAT THE ALABAMA DID ON THE RUN NORTH.

	Passed Stakeboat. h.	m.	s.	Elapsed Time. By Capt. Sargent. m.	s.	Official. m.	s.	Average Speed in Knots. By Capt. Sargent.	By trial board but not official
No. 1, Texas	10	29	35	..	..	..	..	.....	.....
No. 2, Osceola	10	52	55	23	30	23	27	16.97	16.89
No. 3, Kearsarge	11	16	25	23	30	23	30	16.85	16.85
No. 4, Kentucky	11	38	23	21	58	21	58	18.02	18.03
No. 5, Indiana	12	02	38	24	15	24	13	16.33	16.36
No. 6, Massachusetts	12	24	52	22	14	22	12	17.81	17.37
Entire Average North								17.196	17.10

ON THE RUN SOUTH.

No. 6, Massachusetts	12	42	26	..	..	..	..	.....	.....
No. 5, Indiana	1	04	58	22	32	22	33	17.61	17.56
No. 4, Kentucky	1	29	08	24	01	24	09	16.38	16.40
No. 3, Kearsarge	1	52	10	23	05	23	04	17.19	17.22
No. 2, Osceola	2	16	23	24	13	24	14	16.29	16.34
No. 1, Texas	2	39	58	23	35	23	33	16.79	16.31
Entire Average South								16.852	16.866

	By Capt. Sargent. h.	m.	s.	By the Board h.	m.	s.
Total Elapsed Time Going North	1	55	17	1	55	27
Total Elapsed Time Going South	1	57	32	1	57	30

Entire Average North and South, Capt. Sargent's Figures, Subject to Tidal Corrections, etc., Knots 17.024
By Official Board, Not Corrected and Not Official, Knots 16.983

The engines of the splendid battleship Alabama were designed by the steam engineering bureau of the navy department, under the direction of the engineer-in-chief, Admiral Melville. It was for this reason that the builder of the Alabama telegraphed Admiral Melville as follows:

Philadelphia, Aug. 31, 1900.

Congratulate you on performance of engines on Alabama. We could have gone to Europe if we had coal enough. Nothing to do to engines, boilers. Best yet. EDWIN S. CRAMP.

Admiral Melville made the following response:

Well done, Alabama. The honors are all yours.

The trial trip of the Wisconsin will occur on Sept. 15. The requirements of the trial will be the same as those observed in the case of the Alabama, which is a sister ship. The course over which the Wisconsin will run will be in Santa Barbara channel and will be 32 knots in length. When the Wisconsin is placed in commission she will be under the command of Capt. G. C. Reiter.

TRADE NOTES.

The Magnolia Metal Co. of New York, sole owners and manufacturers of Magnolia metal, have opened a branch office in Philadelphia, rooms 411 and 412 Hale building.

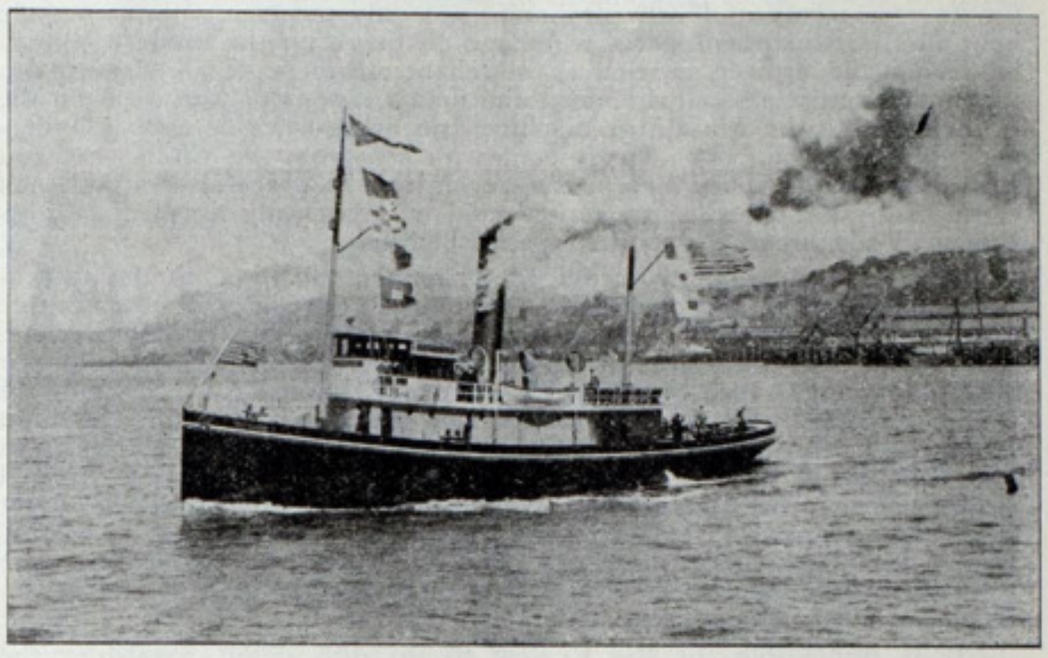
The Cleveland Punch & Shear Works has recently made shipments of tools as follows: Radial drill, 8-ft. kind, to Center Star Mining Co., Rossland, B. C.; 50-in. rotary planer to Milliken Bros., Brooklyn, N. Y.; 10-ft. power bending rolls to Southern Railway Co., Atlanta, Ga.; 30-in. throat punch to H. W. Markey & Co., Seattle, Wash.; 19-in. throat punch to American Clay Working Machinery Co., Bucyrus, O., and a No. 3 bar shear to American Axe & Tool Co., Beaver Falls, Pa.

The C. W. Trainer Mfg. Co., Boston Mass., has just completed work aboard the ocean towboats Buccaneer and Tormenter for the Atlantic Works, East Boston; also aboard a new ferryboat for the city of Boston. The work consisted of applying their featherweight cement to boilers and fire sheet sectional covering to steam pipes. These materials are especially adapted for marine work, on account of their light weight.

QUEEN TUG BOAT OF PACIFIC COAST.

The ocean-going steel tug "Tatoosh" recently built by the Moran Bros. Co., Seattle, Wash., has just returned from her first trip, which was the difficult task of taking a monster log raft from Puget Sound to San Francisco, and, although fresh from the builders' hands, made the round trip without developing a single defect in the hull or machinery. This type of log raft will be found illustrated on the opposite page.

The Tatoosh, which has been previously described in part in the Review, is a strictly up-to-date tug boat, and, taking as a basis the result of her official trial trip in which she made over 14 knots, she properly ranks as the queen of the entire Pacific coast tug boat fleet. The Tatoosh is 128 ft. long, 25 ft. beam and 15 ft. 3 in. depth of hold. The vessel is built entirely of steel, including the main deck house. The pilot house is of hard wood. The furnishings throughout are far superior in style to those on other boats of her class, and the general arrangement of the accommodations is complete and first-class in every particular. The machinery is modern in design and most complete for all purposes. The propelling engine is of the inverted, triple expansion type with cylinders of 16, 24 and 40 in. respective diameters, and a stroke of 28 in. Steam is supplied at a working pressure of 160 lbs. per sq. in. by two main cylindrical return tube boilers, each 11 ft. in diameter and 10 ft. in length, and a donkey boiler of the same type, 5 ft. in diameter and 8 ft. in length. The auxiliary machinery includes a powerful electric light plant, a complete evaporating and distilling plant and several other items not usually fitted on vessels of her class. Steam towing engines and all other modern appliances are included in the equipment. The vessel has two masts and is schooner rigged with ample sail area to make use of the wind as a propelling power.



STEEL TUG TATOOSH, BUILT BY MORAN BROS. CO., SEATTLE, WASH.

There were no contract requirements as to the speed of the tug, the principal conditions being that the vessel should be an efficient tug boat with economy in cost of power, which conditions have been shown by the results of the trials to have been fully complied with. As to speed, she far exceeds the expectations of her owners, the average speed maintained during a six hour run being over 14 knots, and her trial performance generally is a credit to her builders. The design of the vessel was made by Moran Bros. Co. for the Puget Sound Tug Boat Co. which owns and operates her. This company has also added the steel tug Dolphin, another of the Moran Bros. Co.'s boats, to its fleet.

FOREIGN MARITIME NOTES.

At the meeting of the shareholders of the Bremen Vulcan Ship Building Co. on the 11th ult. the proposal to raise the capital from 3,000,000 to 4,000,000 marks was adopted. Half a million marks were also added to the capital last spring. The increase of capital has the double object of contributing 600,000 francs towards the establishment of ship building and repairing works at Antwerp, and of devoting 500,000 marks to the extension of the company's own business. The company is provided with abundance of work both for the present and the coming year.

Many old passenger boats have been bought up recently on Russian account for transport purposes, great difficulty having been experienced in chartering suitable vessels. Among those reported to have been purchased are: The Cunard boat Cephalonia, built in 1882, and the Holland-America Line steamer Werkendam, built in 1881. The new twin screw boat Potosi has also been bought in England, and the British steamers Sicilian and Johannesburg are about to go to Odessa for Russian transport purposes.

The East Asiatic Steam Navigation Co. of Copenhagen, has concluded a contract with the Russian government for the conveyance of 10,500 troops to China from St. Petersburg and Odessa. In order to execute this contract the company has hired fourteen steamers—British, Danish, German, French, and Austrian.

The fleet of Messrs. F. C. Horn of Schleswig, has been increased by the launch at Rostock on the 11th inst. of a steel cargo steamer of 2,200 tons dead weight capacity named the Hilda Horn. She is intended for the North Sea, Baltic, Mediterranean, and transatlantic services, and her speed will be 11 knots.

Six more of the Hamburg-American line boats (Palatia, Arkadia, Andalusia, Valdivia, Brisgavia, and Abessinia) and five more of the Norddeutscher Lloyd fleet (Crefeld, Darmstadt, Hannover, Roland and Norderney) have been taken up by the German government for transport purposes.

The proposed dividend of the Flensburg Ship Building Co. for the past working year is 18 per cent., and large sums will be written off for depreciation and added to the reserves. The dividend is the same as that for the previous year.

A SPLENDID NAVAL EXHIBIT.

THAT OF THE BRITISH FIRM OF VICKERS, SONS & MAXIM AT THE PARIS EXPOSITION—SOME NOVELTIES IN GUN AND SHIP CONSTRUCTION.

One of the features of the Paris exposition which has proved a great attraction to the general public as well as to the seeker after knowledge is the exhibit of the British firm of Vickers, Sons & Maxim, which occupies a large special pavilion of unique and appropriate design, by M. Alphonse Richardiere of Paris. It resembles a great oval fort with dome-shaped walls dotted with ports through which guns of all calibre peep, while the top is flat and represents the deck of a mighty warship well equipped with armor protected guns, while the masts have the usual military tops. Thus there is at once indicated the combination which gives the firm a distinctive place among the world's industrial concerns, for its great army of 15,000 mechanics not only produce without outside help all the constituent parts which go to make up the modern line of battleship and cruiser, as well as merchant steamers of all classes, but they manufacture also all the naval and field weapons of warfare from the 12-inch gun to the Maxim or machine gun firing 600 rifle calibre bullets per minute, and likewise the projectiles for all—from the 850-lb. shot and shell downwards. They also pursue several of the peaceful arts and each of the many branches is fitly represented by beautifully finished exhibits shown to advantage within this special building.

The Vickers' pavilion occupies a prominent position not far distant from the "Street of Nations" and contiguous to the palais des Armées de Terre et Mer. By day this representation of a warship is gaily decked, rainbow fashion, with flags of all nations, and by night search lights on the military tops serve equally well to attract the visitors. It would be difficult to name one of the thousand and one items within the pavilion which does not call for special description; almost all the exhibits have been designed as well as constructed within the past year or two. Indeed some guns are the first of their type, which have gone to Paris direct from the company's ranges, where new guns are proved. Notable among these are the following: The gas gun of rifle calibre, the 3-pounder, 6-pounder and 14-pounder automatic guns, and the 7.5-in. naval and coast defense gun.

It is impossible for the Review to go into detail regarding the various features of the exhibit and therefore the article will be limited to that part which pertains directly to naval equipment. As to the naval guns exhibited attention may first be directed to the breech block, which is also common to the field guns. This form of block is now adopted for all guns for the British navy. Usually the screw breech block is uniformly cylindrical or parallel, the screw being so interrupted that threaded and plane surfaces alternate for equal parts of the circumference. The result is that when closed only one-half of the circumference is available for resisting the pressure due to the explosive gases of the compounds. Vickers' breech block on the other hand is divided circumferentially into segmental portions in regular steps of varying radii. Thus the 12-in. gun has eight segments, and of these six are threaded so that three-fourths instead of one-half of the circumference is available for resisting the pressure. This enables the breech block to be shortened by something like one-third of its length and the breech end of the gun, which is by far the heaviest part, is correspondingly reduced. The weight thus saved at the breech when added at the muzzle greatly increases the period of the propulsive effect of the powder and accelerates the speed and energy of the projectile, and thus enormously adds to the power of the gun. The 12-in. Vickers' gun develops a muzzle energy of 39,843 ft. tons, whereas according to Brassey's naval annual, the corresponding result with the British service gun of the same bore is 33,020 ft. tons, with the French naval gun 30,750 ft. tons, with the United States naval gun 25,985, and with the Elswick gun 33,949 ft. tons. Moreover, the shortening of the breech block simplifies the operation of working it. A 12-in. gun is shown in the Paris pavilion and as the Maxim is placed alongside they constitute an effective contrast. The one fires a bullet of 215 grains, the other a projectile twenty-eight thousand times heavier—an 850-lb. shot—but each has its place in modern war equipment, and each is indispensable.

The firm exhibits all their naval guns—the 12-in. 50-ton gun, the 9.2-in 27-ton weapon used in cruisers and for coast defense, the 7.5-in. 16-ton gun—an entirely new weapon, as well as the 6-in. and 4.7-in. quick-firers. These are all constructed on the wire wound system. They have the special breech mechanism already described, with the mechanically operated tray for feeding the projectiles into the chamber, all characteristic features of Vickers' ordnance. For all these guns the company construct mountings and the frequent working of these great weapons with their simple mechanism delights the crowds which invade the building. The mountings made are of all types, for ships, turrets, coast defense and disappearing.

Reference should be made to the new 7.5-in. gun, a particularly suitable weapon for naval work, as it is felt that something superior to the ordinary 6-in. quick-firing gun is required for cruisers if not also for battleships. This gun fires a shot exactly double the weight of the projectile for the 6-in. weapon, and at a higher velocity, and thus the energy is 11,825 ft. tons. As six such shots can be fired per minute it is scarcely necessary to enforce the suitability of the new gun, especially for cruisers. In the French naval service there is a weapon of about this calibre, but its muzzle energy is only 7,898 ft. tons. Vickers' 6-in. quick-firer shows a similar superiority over its competitors of the same calibre, the British service type for instance only attaining 3,356 ft. tons against its 5,340 ft. tons; but now the British ships, as well as those of the United States, will have guns of the Vickers' type.

Among the drawings and photographs placed in the Vickers' pavilion there is to be especially observed a new barbette mounting for 24 cm. gun, which the Vickers' company are now building for the Turkish ironclad Messudijeh. Without going deeply into details, one special feature is interesting, inasmuch as by means of a simple and effective device the projectile and the powder charge can be rammed into the gun chamber at whatever angle of elevation or depression or of training the gun may happen to be at the time. As such an arrangement greatly facilitates the loading a considerable increase in the rapidity of fire is obtained. Two of these mountings will be placed on the Messudijeh, one in the bows and one in the stern, and, what with a large number of Vickers' 6-in. guns and smaller quick-firers, this battleship will evidently be fully brought up to the most modern requirements.

But the firm are not only manufacturers of ordnance of all types and sizes; they build the warships from keel to truck, clothing them with armor, equipping them with propelling machinery as well as with ordnance, and making them habitable sea-going fighting machines. At the present time they are building, besides smaller fighting craft, five ironclads, one of them—the largest battleship in the world—of 15,200 tons displacement; while another will be the fastest and largest cruiser in the world, of 14,200 tons, to steam 23 knots. In the gallery around the Vickers' pavilion there are arranged ship models which are perfect in their artistic finish and in their completeness of details. Every type of fighting ship is thus represented—submarine boat, torpedo boat destroyers, gunboats, protective and armored cruisers from 3,400 to 14,200 tons, and battleships of the most powerful order. To describe these would involve a treatise on a modern navy, for within the past two or three years Vickers, Sons & Maxim have constructed vessels almost sufficient to constitute a first-class squadron of large proportions. Their ship building works are of great capacity and give employment to some 7,000 men. One or two details, however, are worth mentioning. Originality of design is attained by an experienced staff. An instance is found in the disposition of the armor of a Japanese battleship now building. The 6-in. quick-firing guns, of which there are fourteen, are to be enclosed in an armored box battery extending the whole length of the citadel. Thus from 5 ft. or 6 ft. below the load water line to the upper deck the whole side of the ship will be completely covered with hard faced steel made by the latest cementation process by the Vickers' company. The isolation of each gun afforded by the usual separate casemates is secured in this Japanese ship by the introduction of thick steel bulkheads placed between each of the gun stations and in the rear of the guns. In the ordinary design the broadside between the casemates is left without armor, whereas in the Japanese ship the protection is continuous. In other words, about five-eights of the whole area of the ship exposed to gun fire is armored, against one-half with the casemate arrangement.

LARGEST DREDGER AFLOAT.

One of the most extensive builders of dredges in the world is the firm of William Simons & Co., Ltd., of Renfrew, and their products are already well known to the readers of the Review. The firm has now just completed a dredge which is the largest of her type afloat. This latest product is named La Puissante. The next nearest in point of size and carrying capacity is the Percy Sanderson, constructed by the same firm in 1894 for the European commission of the Danube. The Sanderson has a hopper capacity of 1,250 tons while La Puissante has a hopper capacity for 42,372 cubic feet of dredgings or 2,200 tons.

Dimensions of La Puissante are 275 ft. by 47 ft. by 19 ft., and her draught loaded 16 ft. 5 in. Accommodation is provided forward for the officers and superintendent. Accommodations for the crew, consisting of native and European quarters, is provided on each side of the ladder well amidships. The bucket ladder has a maximum dredging depth of 40 ft.; the minimum dredging depth is only limited by the vessel's draught. The propelling engines are of the compound triple expansion type, there being two sets of 1,800 I. H. P., either set being capable of driving the dredging gear independently of the other. The auxiliary machinery in the engine room includes separate duplex pump of the Blake-Knowles type for boiler feeding purposes, and one large horizontal duplex pump of the same type for ballast tanks and bilge purposes, and also for supplying water to assist the dredged material along shoots. Combined feed heater and filter, steam starting, turning and reversing engines are also included in the engine room. A unique feature in the arrangement of the machinery on this type of vessel is that the boilers have one common stoke hold arranged aft of the engine space and adjacent thereto, and both engines and boiler spaces aft of the hopper space. With this arrangement the engineer in charge has full control of engines and boilers without requiring to go on deck. Steam is supplied to the engines and auxiliary machinery from two mild steel boilers constructed for a working pressure of 160 lbs. per square inch.

La Puissante underwent an exhaustive series of dredging and steaming trials recently, the following results being obtained: On the extended series of dredging trials the vessel loaded its own large hopper (say 2,200 tons capacity) at the average rate of 1,600 tons per hour, or 450 tons per hour more than required by contract. Running on the measured mile at Skelmorlie, La Puissante gave a mean speed, with and against the tide, of 9¾ knots per hour, or ¾ of a knot over the contract speed. Immediately after the speed trials the dredger went on a six hours' run at full speed, when the coal consumption was taken at 1.66 lbs. per I. H. P. per hour, a result well under that required by the contract.

NOT A PROFITABLE VENTURE.

Directors of the Manchester Ship Canal Co. in their report for the first half of the present year state that the amount owing to the Manchester corporation for unpaid interest is £1,131,250. The net outlay of capital on ship canal property in the six months was £15,465. The capital account has been credited with £522,000, proceeds of the sale of Duke's dock, Liverpool, and with £2,454 from other sales of Bridgewater land, and has been debited with £10,576, the cost of the Duke's dock arbitration. The ship canal revenue receipts amounted to £141,346, as compared with £124,183 in the corresponding half of last year, and the expenditure to £99,945, against £91,358, leaving a credit balance of £41,400, against £32,825 a year ago. The profits of the Bridgewater canal were £17,807, as compared with £21,905 in the first half of 1899. The bankers' and general interest amounted to £3,022, against £1,066 for the corresponding period, making the net revenue for the half year £62,230, against £55,796. The directors have been able to pay out of the profits of the half year the interest due on the first and second mortgage debentures (£44,742), leaving a balance of £16,488, which has been paid to the corporation of Manchester on account of the interest due on the debentures they hold. The weight of toll paying merchandise which passed over the ship canal in the six months was 1,487,841 tons, against 1,325,821 tons in the six months ending June 30, 1899.

AMERICAN MERCANTILE MARINE.

Complete official returns for the fiscal year ended June 30, 1900, compiled by Eugene Tyler Chamberlain, commissioner of navigation, show that 1,446 vessels of 393,168 gross tons were built and documented in the United States. Since 1856 this record has been exceeded only twice; in 1864, when 415,740 gross tons were built, and in 1874, when 432,725 gross tons were built. The construction may be classed according to the following types: Schooners, schooner barges and sloops, 499 of 109,605 gross tons; great lake steam vessels twenty-five, of 97,847 gross tons; canal boats and barges 523, of 74,860 gross tons; ocean screw steamships twenty, of 60,369 gross tons (of which all but one, the Maracaibo, 1,771 gross tons, were built wholly or principally for trades reserved by law to American vessels); river steamers 375, of 44,282 gross tons; square rigged vessels four, of 6,205 gross tons.

The steam vessels built—420 of 202,498 gross tons—surpass the record, the nearest approach being 1,891, when 488 steam vessels of 185,037 gross tons were built.

The steel vessels built—ninety of 196,851 gross tons—exceed the previous record year 1899, when ninety-one such vessels of 131,379 gross tons were built. Cleveland, Ohio, ranks easily first as builder of steel vessels, with nine steamships of 42,119 gross tons, followed by Newport News, seven steamships of 28,202 gross tons; Chicago, five vessels, 24,504 tons; Detroit, four steamships, of 15,693 tons. During the past decade the steel steam vessels built in the United States aggregate 465 of 742,830 gross tons, of which 198 of 450,089 gross tons were built on the great lakes. For comparison it may be noted that the British board of trade reports that 727 steel steam vessels of 1,423,344 gross tons were built in the United Kingdom during 1899. During the ten years sixty-nine steel steam vessels of 194,080 gross tons were built at Cleveland and 110 of 138,593 gross tons at Philadelphia.

The total tonnage built and documented on the great lakes during the year—125 vessels of 130,611 gross tons—is the largest in the history of that region. The total for the Middle Atlantic and Gulf coasts, 605 vessels of 135,473 tons, exceed any record since 1872. The total for the New England coast, 199 vessels of 72,179 gross tons, has not been equalled since 1891, while the product of the Pacific coast, 300 vessels of 40,396 tons, is surpassed only by the returns of 1898 and 1899. Construction on Mississippi river and tributaries, 217 vessels of 14,509 tons, is 9,000 less than 1899. The foregoing figures do not cover yachts or government vessels.

LARGEST ELEVATOR IN THE WORLD.

The Peavey elevator, now in course of construction on Rice's point at Duluth, will be the largest in the world, as the grain storage capacity is to be 3,750,000 bushels. The structure will be 222x204 ft. and 125 ft. high. From the exterior it will appear to consist of a number of large cylindrical compartments separated from each other by short straight walls. The building will contain thirty circular, or fundamental bins, and twenty square, or secondary bins. The former are ranged in rows of five each and are separated from each other by a distance of 7 ft. They will measure 33½ ft. in diameter and rise to almost the height of the building, namely, 125 ft. The walls at the base will be 12 in. in thickness but will gradually diminish until at the top they will be 6 in. thick. They will be composed of solid concrete, in which will be imbedded steel bands ⅜x1½ in. The bands will extend around the bins in a horizontal direction in order to lend strength and firmness to the wall and make them capable of resisting pressure of the grain from within. Connecting each circular bin with the one adjoining will be a wall similar in construction to the walls of the bins, except that the rods will be straight, and instead of being joined at the ends will be fastened to the walls of the bins. By means of the connecting wall the secondary or square bin is formed. The sides are concave, being simply the exterior walls of the four adjoining circular bins. These bins will measure 40 ft. in their widest parts, but owing to their concave sides they will not have as great capacity as the circular bins. The arrangement of the bins is such, however, that there is no waste space.

The capacity of each of the circular bins will be about 78,000 bushels. The thirty bins of this kind, therefore, have an aggregate capacity of about 2,400,000 bushels. The twenty square bins have an aggregate capacity of 1,400,000 bushels, or about 69,000 bushels each. The total, according to these figures, gives the elevator a capacity of 3,800,000 bushels, though it is generally referred to as a 3,750,000-bushel elevator. There will be no means of reaching the top of the building from the interior, but a passenger elevator will be established between two of the circular bins on one side of the great structure. The roof will be flat, and like the remainder of the building will be of concrete and steel construction. There will be no openings in the solid walls except at the bottom, where five tunnels, or archways, will run toward the interior. The building will rest upon a foundation of piling and concrete.

TOWING MACHINES.

Since November last the American Ship Windlass Co. of Providence, R. I., has made and delivered sixteen towing machines of the Shaw & Spiegle kind, which have proven so successful in the towing of steel barges (some of them of 8,000 tons capacity) in the roughest kind of weather. The list of recent sales includes machines for the Alaska Packers' Association steamer Kvichak; New York, Philadelphia & Norfolk R. R. Co.'s tug Delmar; and on the great lakes for James Corrigan's steamers J. Emory Owen, Robert Wallace, Quito, Minnesota and Iron Chief; James Davidson's steamers Shenandoah and Cartagena; Minnesota Steamship Co.'s barges Madeira and Marsala; Bessemer Steamship Co.'s steamers Van Hise and Bunsen; W. H. Wolf's barge Armenia, and two steel barges building at West Superior, Wis., for A. B. Wolvin and others of Duluth.

A special from Halifax, N. S., says that the second largest deal in the history of coal mining in Cape Breton was completed at Halifax on Aug. 31, when the properties of the General Mining Association of London were formally transferred to the Nova Scotia Steel Co. for $1,500,000. The sale includes the mines, mining equipment and buildings at North Sydney, besides 100 other properties. The coal areas involved are 21 miles in extent. The purchasers are floating a gigantic coal and steel combination in London, with smelters at North Sydney and a ship building branch at Halifax.

THE ROLE OF THE TORPEDO IN WAR.

Naval experts seem by no means to have arrived at a definite conclusion as to the part which the torpedo is likely to play in future naval war, or it might be more strictly accurate to say that opinion on this point is widely divided, many naval officers and experts in Europe and on the other side of the Atlantic holding that the torpedo will prove itself as an offensive weapon second only in importance to the gun, if indeed it be not the most formidable engine of destruction with which a war ship can be armed or attacked. On the other hand, equally competent, though perhaps less numerous, authorities, basing their opinion upon the negative, or at least inconclusive results which attended the employment of the torpedo in the China-Japanese and Spanish-American wars, have arrived at the conclusion that its effect has been greatly overrated by enthusiasts, and that the gun, and the gun alone is the weapon by which, in the future, as in the past, decisive results will be attained in naval warfare. Formidable as the torpedo must be admitted to be within a range which may be approximately fixed at about 800 yards, there seems no reason to suppose, so far as we can judge from recent experience, that it can be effectively employed against a watchful enemy, either by day or night, when that enemy has sea room, and the assailant is consequently forced to expose himself to a hail of projectiles from the quick-firing artillery of the quarry before getting within torpedo range. Several determined attempts to torpedo war ships under such circumstances were made both at Santiago de Cuba and at Manila, but in no case successfully. the attacking torpedo boats being in every instance easily sunk or put hors de combat by the war ships attacked. On the other hand, several Chinese vessels which had taken refuge in the harbor of Wei-Hai-Wei after the battle of the Yalu river were blown up at anchor by night attacks, delivered with consummate skill and daring by torpedo vessels of the Japanese fleet, under the command of Capt. Ito. What makes the feat performed by the Japanese still more remarkable is that, in order to get at the enemy, the torpedo vessels had to find their way in the darkness of night along the bar or boom constructed by the Chinese to a gap caused by the end of the barrier having dragged from a shoal to which it had been fixed, leaving an opening which the Japanese were not slow to discover and utilize. Having felt their way through this opening, they had then, turning sharp round, to steal along the inner side of the boom, and find as best they could their prey, which rode at anchor in the spacious waters of the port, with all lights extinguished. Except, however, for the moral effect produced upon the Chinese fleet, the daring enterprise of the assailants, while highly creditable to them as a feat of arms, can hardly be pronounced an important or unqualified success. One torpedo vessel was sunk by the fire of the Chinese and another ran aground on the shoal and became a total loss. The very circumstances also which permitted the attack to be made, practically compelled the assailants to torpedo the first vessels they could find in the darkness, and, as it happened, the torpedoed vessels, two transports and a small cruiser were of little military value. It is also to be observed that had the Chinese exercised a proper vigilance there can be no doubt that they would have discovered and made good the dragging of the boom which gave access to the enemy, and the Chinese squadron might have ridden at anchor secure against attack. Belief, however, in the efficacy of the torpedo boat, though somewhat shaken by the occurrences of the Spanish-American war, is by no means extinct, if we may judge by the large numbers of these craft which are being added to the principal navies of the world, and especially our own and those of France and the United States, the latter country claiming, and apparently with good reason, if we except the Viper and the Cobra, to possess the fastest torpedo vessels for their displacement in existence. A remarkable fact in connection with the history of the torpedo is the slowness of its progress towards perfection, especially in the all-important matter of range, the extreme shortness of which makes the claims recently put forward by enthusiastic French and Italian partisans of the weapon appear highly exaggerated. These writers, two at least of whom are torpedo officers, actually go so far as to maintain that the torpedo should be considered the principal, if not indeed the sole, weapon of the war ship, and that everything else should be subordinated to its effective employment. All the occurrences, however, of recent naval warfare seem to show that actions are decided at ranges not below 3,000 to 4,000 yards, and even these ranges will probably be increased in future naval battles by improvements increasing the range and accuracy of modern artillery. The natural inference seems, therefore, to be that, except for the purely defensive purposes of coast and harbor protection, the value of the torpedo and of the torpedo vessel will diminish rather than increase, unless inventors devoting their attention to the torpedo should discover some means by which its present restricted sphere of effective action would be greatly extended.—Admiralty and Horse Guards Gazette.

OUR LEGACIES AND BEQUESTS.

At a recent gathering in Boston one of the speakers made the following impressive statement: "The century received from its predecessors the horse; we bequeath the bicycle, the locomotive and the automobile. We received the goose quill, and bequeath the typewriter; we received the scythe, we bequeath the mowing machine; we received the sickle, we bequeath the harvester; we received the hand printing press, we bequeath the Hoe cylinder press; we received Johnson's dictionary, we bequeath the Century dictionary; we received gunpowder, we bequeath nitroglycerine; we received the tallow dip, we bequeath the arc light; we received the galvanic battery, we bequeath the dynamo; we received the flint lock, we bequeath automatic firing Maxim guns; we received the sailing ship, we bequeath the steamship, the greyhound of the sea; we received the frigate Constitution, we bequeath the battleship Oregon; we received the beacon signal fire, we bequeath the telephone and wireless telegraphy; we received wood and stone for structures, we bequeath twenty-storied skyscrapers of steel. Such are a few of the bequests of the nineteenth century to the twentieth."

The torpedo boat destroyer Viper, which is fitted with Parsons' turbine engines, had a three hours' coal consumption trial in the Solent last Thursday. She averaged close to 34 knots without forcing her. She covered one measured mile at a rate of speed within a fraction of 36 knots per hour. This is the fastest time recorded by any warship. The Viper exceeded her contract requirements by five knots.

MARINE REVIEW

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There was a time once when the people of Boston viewed with indifference the contemplated destruction of the frigate Constitution, then rotting out in neglect her shattered sides in the harbor. It remained for Oliver Wendell Holmes to quicken their consciences. There is probably no single instance on record in which a printed poem so electrified and shamed a people.

Aye, tear her shattered ensign down,
Loose every threadbare sail.

The people of Boston were thoroughly aroused when, at their breakfasts, they read the poem in the newspapers. A wave of indignation at the plan of destruction swept over the city and "Old Ironsides" was saved. The poet did his work well. Its effect is being felt today. The Massachusetts society, Daughters of the War of 1812, have undertaken the complete restoration of the old frigate. The movement is being aided in nearly every city in the union, and enough is being pledged to completely rebuild her. It is planned to give a fine souvenir to all who subscribe. The Massachusetts society started the subscriptions with a check for $100. The firm of Kidder, Peabody & Co. is acting as treasurer.

An English squadron lies at anchor at Frenchman's bay, Bar Harbor, Me., at present. The squadron consists of the flagship Crescent, Vice Admiral Bedford commanding, the Tribune, Psyche, Indefatigable and Quail. An American squadron, consisting of the New York, Indiana, Texas, Massachusetts, Kearsarge and Kentucky is there too. Both squadrons are coughing smoky salutes at each other. It is Great Britain's call of honor, and the town is beautifully decorated for the occasion. The Union Jack and the Stars and Stripes are blended. The natty looking English marines with their jackets cut into the waist, their caps rakishly drawn down, and who walk jauntily with their sticks under their arms, are a contrast to the American marines who have a much quieter bearing. The newspaper reports say that the jackies are taking kindly to the reception, though the aspect of a strictly temperance town is mystifying to them. For that reason they are proceeding with caution, not being quite sure of their bearings.

The report of the Manchester Ship Canal Co., found elsewhere in this issue, shows that the canal owes its patient creditor, the Manchester Corporation the highly respectable figure of over £1,000,000 on interest account. Apparently the canal is doing worse. All of which goes to prove that a canal to pay must connect great bodies of waterways—witness the Sault and Suez. A blind canal will never pay. The promoters of the erstwhile Pittsburg ship canal scheme can read a lesson in Manchester; but evidently they have already thoroughly conned it. With the Isthmian canal it is different. That connects oceans. It opens a pathway for the freight of two worlds. History proves that such a canal would pay.

The converted yacht Hawk which has been placed at the disposal of the Ohio naval reserves, is about to leave Norfolk, Va., for Cleveland. The gunboat has been thoroughly equipped with naval supplies, and the equipment is just as much of a military nature as though she were going to China. The vessel is a beautiful one and will doubtless do much to stimulate interest in the naval reserves of Ohio.

Orders have been received from St. Petersburg by the Russian naval inspectors at Cramps' ship yards, Philadelphia, which will necessitate a new trial by the cruiser Variag before her formal acceptance by the Russian government. This is due to the accident which happened during the last trial, when the head of one of the high pressure cylinders was cracked. A sustained speed of 23 knots for twelve hours is required by the contract. The vessel exceeded this by 1.6 knots for six consecutive hours, when the accident occurred. It was not expected that a new trial would be demanded, as the accident is one of common occurrence aboard first-class ships. No date for the new trial has been decided upon.

The steamship Californian, about the safety of which some doubt was expressed, has arrived safely at Manila, with a broken propeller. She was laid up several days at Guam for repairs. The Californian was launched last May from the Union Iron Works, San Francisco, Cal., and the present is her maiden trip. She is chartered as a government transport.

Among the firms incorporated at Trenton, N. J., this week was the Northwestern Steamship Co., the object of which is to operate steamships. The capital stock is $1,000,000 and the incorporators are Eliot Norton, George G. Duy and Robert G. Martin of New York. The principal office of the company will be located in Jersey City.

AROUND THE GREAT LAKES.

The Great Lakes Towing Co. has decided not to bid on the job of raising the Specular.

About Oct. 1 the color of the rear light in the range on the west pier at Conneaut will be changed from white to red, and about the same date the color of the fog signal house at Presque Isle, Lake Erie, will be changed from brown to white.

The largest dipper dredge in America was successfully launched at the St. Lawrence marine railway dock, Ogdensburg, N. Y., last week. It is valued at $100,000, and its dimensions are 115 ft. in length, 40 ft. beam, drawing 12.2 ft. at working end and 10½ ft. at stern.

A beacon light has been established in the water on the point of a shoal making out from Brush point, on the southeasterly side and near the head of St. Mary's river, Mich. A fixed white light will be shown from a lens lantern twelve (12) feet above the level of the lake.

Bids for the construction of a new bascule bridge over the river at Canal street were presented to the sanitary trustees, Chicago, last week, the lowest bidders being the American Bridge Co. for $139,942 and the Toledo Bridge Co. for $140,979. The bids were referred to the engineering committee.

Officials of the Lake Carriers' Association have asked the marine department of Canada to place a telephone in the light-house at Long Point, Lake Erie, as great numbers of vessels seek shelter from fall gales, and a telephone at the light-house would be very serviceable. At present there is no means of communication with the main land.

Out of seventeen steamers under contract with the American Ship Building Co. for delivery next spring eight are to be equipped with the Howden system of hot draft, which has been so strongly upheld by officials of the Detroit works. A very large amount of boiler and engine repairs is planned for the Detroit works for the coming winter. Never in the history of the company has there been so much work in hand thus early in the season.

Probably not all of the vessel masters are aware of it, but the American channel to the westward of Stag island, St. Clair river, has recently been dredged so that the very largest of the freighters may now make use of it. An effort is being made by the Lake Carriers' Association to have the channel lighted. This will, of course, be done, as the lighting must necessarily follow the expense to the government involved in the dredging. The new passage can now be used in daylight and advantage will undoubtedly be taken of it, especially by the down bound vessels, as soon as a few of the masters make a move in that direction.

The Union line steamer Chemung ran on a rock in the harbor of Waukegan Monday last as she was coming in with a cargo of coal. The bottom was punctured by the boulder and the steamer settled down upon the mud. An investigation showed that a large hole had been cut into the forward compartment of her water bottom on the starboard side, and the pumps were unable to empty it. The steamer was only 400 ft. from the coal dock, and the work of lightering the cargo was begun at once. The rock on which the Chemung struck lies in the harbor around the bend and not far from the coal dock. The Chemung's cargo is 2,700 tons of coal and she drew but 16½ ft.

Shipments of ore from all ports for August were 2,911,622 tons, making the total movement up to Sept. 1, 12,366,022 tons, which is a gain of 1,695,554 tons over the shipment for the same time last year. Shipments for August show a decrease of 102,023 tons, compared with the same month last year, and they are about 125,000 tons below the movement of July this year. Duluth still leads, with Two Harbors second and Escanaba third. In 1899 more ore was moved in August than any other month in the year, so that the falling off last month does not amount to much, and it will probably be more than made up this month. It is now quite certain that the total movement of ore for 1900, including all rail shipment, will come pretty close to the 20,000,000 ton mark.

Powell & Mitchell, Marquette, Mich, are now rapidly getting things in shape for a big production of ore at the Helen mine where they have a big contract from the Lake Superior Mining Co. They are now shipping 1,000 tons of ore per day, but when their force is filled out to 700 men this production will be greatly exceeded. At present there are some 300 hands at the property, but many of this number are engaged on work other than mining. The development of the Helen mine stands forth as one of the most notable achievements in the history of the Lake Superior mineral industry. Last August the site of its wonderful deposit of ore was undisturbed by man's activity. Now it is the home of an army of laborers and miners, and the terminal of a twelve mile railroad leading to Lake Superior, and the scene of an unrivaled building and business boom.

For the first year in the history of the Lake Superior iron mining region more than two mines will produce over 1,000,000 tons each. Such a quantity of freight, originating from one property, is almost inconceivable; is so to those unacquainted with the work of mining and shipping it. A million tons means that in seven months there must be hauled on trains away from the mine 40,000 carloads of ore, or an average of about six trains a day. It means that from a few shafts there must be raised every day for the entire year 3,000 tons. Last year two mines, both on the Mesaba range in Minnesota, were able to make this production. This year not less than four will do so. The amount of ore that single mines are producing is constantly increasing and a mine of less than 250,000 tons in a season is small. Not only is the year showing a greater production of ore than ever, but the search for new mines and the development of old and abandoned mines has never been equaled in any year in the history of the trade.

Capt. Edward Mooney is highly praised in lake shipping circles for the cool and thorough manner in which he took care of the crew of the steamer Specular after that vessel was run into in the middle of the night, recently, by the steamer Denver in Pelee passage, Lake Erie. In less than a minute after the collision, Capt. Mooney was satisfied that his vessel would sink in a hurry. He had all hands, excepting the engineer, on deck almost within another minute. He hurried himself to the engine room, which was reached by a small passageway, told the engineer to leave his machinery at full speed and hurry to the deck, as he would get no more orders. Then when he saw that a boat, which had been launched, was full, he did not even permit of loss of time that would be involved in getting the woman cook into it, as he knew the depth of water into

which the sinking ship was heading and he was satisfied that she would be safe with the rest of the crew in the rigging. He had hardly climbed into the rigging himself, after all others, when the ship went down, probably six minutes after the accident. The water into which the vessel was headed was not sufficiently deep to cover her pilot house, so that the entire crew was, of course, rescued in the morning without difficulty.

Information is hereby given that on or about August 30, 1900, the following named newly established lights in Portage river, Mich., will be lighted: A fixed red light shown from a lens lantern on a white structure on the extreme end of the pier on the east side of the Portage river entry. A fixed white light shown from a lens lantern in a white house on the extreme end of the west pier, Portage river entry, and forms a range for entering the Portage river, Mich., with the rear white light shown from a tower on the light-keepers' dwelling on the inner end of this pier. This front range light takes the place of a small white lantern shown from the same position, since the destruction of the previous light. Princess Point Light, known as Light No. 11 in Portage river, Mich. (No. 336 in List of Lights and Fog-Signals, Northern Lakes and Rivers, 1900). This light was formerly a fixed white light shown from a lantern on the northeasterly bank of the Portage river at the lower turn off Princess Point, Mich., and nearly opposite Light No. 9. It has now been changed to the north bank of the Portage river opposite its old position, and will show only a red sector of 180 degrees. It is so adjusted that when vessels going up the channel come into this red sector they will have arrived at the turning point of the curve which they must follow around without special guide as to distance from adjoining objects until they come on the range formed by lights Nos. 12 and 10.

The southerly pier of the new Duluth ship canal piers will be finished this fall. Work is progressing favorably upon the northerly pier, but it will not be finished until next year. The piers are being built under the direction of Maj. Clinton B. Sears, United States engineer, upon the continuing contract plan. The construction of the new ship canal piers comes at a very opportune time. The development of commerce has made the necessity for a wider canal felt. The old canal was 250 ft. wide and the new canal will be 300 ft. The entire length of each of the new piers is 1,772 ft. Each pier begins at the harbor end, with a curve having a radius of about 790 ft. and a length of about 440 ft. At the inner end the two piers are 539 ft. apart, and curve toward each other until at the outer end of the curve they are 300 ft. apart. From this point the two piers are parallel to the lake end, or pier heads. The substructures consist of timber cribs filled with gravel and stone and they rest upon a foundation of piling cut off 22 ft. below low water. The cribs are 24 ft. in width and 100 ft. long in each case, except at the outer end, where they are 36 ft. wide. All of the cribs are 21 ft. high, bringing them to within one foot of the surface. The footing blocks are about 5 ft. long, 7 ft. wide and 3 ft. thick and are made of Portland cement, sand and gravel. The mixing was done by hand, and the concrete was deposited in the molds with shovels and rammed in 6-in. layers. Between the footing blocks gravel and rubble is placed to a depth of 2 ft., and upon this and the footing blocks is erected the monolithic concrete work. This is 20 ft. wide at the bottom and 18 ft. wide at the top of the parapet walls. The main portion rises about 7 ft. above low water, and above this rises two parapet walls, each 3 ft. high. The arched passageway, already referred to as running through the piers, is 7 ft. 10 in. wide and 3 ft. high in the center. On the pier heads the dimensions of the respective concrete superstructures are increased. They are 32 ft. wide at the bottom and 29 ft. wide at the top of the parapet walls, which rise 18 ft. above low water datum. Through each of the pier heads are two arched passageways, each 9 ft. wide, 4 ft. 11 in. high at the sides, and 9 ft. 3 in. high in the centers. A lighthouse will be erected upon the southerly pier head.

REPUBLIC IRON AND STEEL CO.

The first annual report of the Republic Iron & Steel Co., which was organized on May 3, 1899, has just been given to the public. Rudolph S. Warner, the president of the company, makes the following statement of the condition of the affairs of the company:

"The various plants taken over by this company have, with but few exceptions, been in full operation since the organization of this company. A great deal of money has been spent at many of our plants to improve their physical condition, and generally our plants have been greatly improved since they were taken over. These expenditures, however, have been charged to operating expenses and form no part of the new construction account in the balance sheet. The Bessemer steel plant, which we have been erecting at our Brown-Bonnell works, Youngstown, Ohio, has recently been completed. Its present capacity is 600 tons per day, but as soon as the new billet mill is completed this plant will have a daily capacity of 1000 tons. We are now enabled to supply our mills with steel from this plant, and are placed in a much more independent position than we were during the past year. The plant is equipped with all modern labor saving appliances to produce steel at the lowest possible cost.

"We have opened out coal mines on the Pioneer property, at Sayreton and Warner, Ala., and are also erecting an additional blast furnace on this property at Thomas, Ala., which will be completed toward the end of this year. This furnace, when completed, will be the most modern and best equipped blast furnace in the South. We are also erecting additional coke ovens at Thomas, Ala., to supply this furnace with coke. When these improvements are completed we will have a group of three well equipped blast furnaces and 850 coke ovens at this point. Of the 26,000 acres of land comprising the Pioneer property in Alabama, 14,000 acres are underlaid with coal which makes an excellent quality of coke and is also a first-class steam coal; 10,000 acres are underlaid with a fine quality of brown ore and red ore, and the balance of the property consists of limestone quarries, town site and adjacent ground. The Pioneer property has sufficient ore, coal and limestone to supply several furnaces for many years.

"We have acquired during the past year an interest in the Mahoning Ore & Steel Co.'s property on the Mesaba range in Minnesota, and also a one-half interest in the Union Ore Co.'s property on this range (a high grade Bessemer ore). This, in addition to the ore properties originally acquired by this company, insures us a full supply of lake ores for our mixture in making Bessemer pig iron at our Northern furnaces. We have also purchased 550 acres of additional coal lands in the Connellsville region, and will be able to supply our Northern furnaces with coke from our own ovens as soon as additional ovens are erected.

"The principal articles manufactured by the company are merchant bar iron and steel, Bessemer, foundry and mill pig iron. In addition thereto our output comprises a considerable tonnage of nuts, bolts, washers, rivets, cut nails, railroad and boat spikes, cold drawn shafting, turn buckles, car axles, forgings, angles, tees, harrow teeth, channels, hexagons, small T nails, splice bars, frog fillings, rail fastenings, special shapes for bicycle makers and for builders of cars, implements, carriages, wagons and bridges. The annual capacity of finished material exceeds 1,000,000 tons. Owing to the large amount of finished material which had been contracted to be manufactured by the constituent companies at low prices for delivery during the last half of 1899, prior to the time the plants were turned over to this company, we did not receive the benefit of the high prices ruling during the first six months after the organization of the company; nevertheless, the net profits of the company, after deducting all expenses and allowing for depreciation, were $3,643,728.92. Of this amount $1,421,679 has been paid by way of dividends on the preference shares of the company, leaving a net surplus of $2,222,049.92. The value of raw and finished materials and supplies in the balance sheet has been arrived at by reducing the cost thereof to the present ruling prices, which are lower than the prices at the close of the fiscal period (June 30), and are on a safe and conservative basis. The deductions for shrinkage and depreciation have been made under the supervision of the executive committee. From the annexed balance sheet it will appear that the current assets of the company on June 30 amounted to $8,892,031.35, and the current liabilities to $1,379,278.67, leaving (after payment of dividends) an excess of current assets over current liabilities of $7,512,752.68.

"The company has no bonds outstanding and no mortgages or liens of any description on any of their properties, except the deferred payments ($214,000, payable in six annual installments) on the Connellsville coal lands acquired since the organization. We have no bills payable, and the current accounts payable shown in the balance sheet have all since been discharged. The plants of the company are protected by fire insurance, the officers and employees occupying positions of trust are under surety bonds, and the company carry a safe line of accident policies. During the coming year the company will be in a position to concentrate their operations in the plants offering the most favorable conditions as to efficiency and cheapness of production, as well as to geographical location nearest the markets of consumption. They will also have the benefit of their new steel plant, new blast furnace and new coke ovens, as well as of the new mines opened. The expenses of the company will also be greatly reduced, the work having now been so systematized as to require a much smaller clerical force.

Annexed to the report is the following balance sheet and profit and loss account, certified to by the audit company of New York:

BALANCE SHEET, JUNE 30, 1900.

Assets.

Real estate, plants, buildings, machinery and other permanent investments		$41,142,251.58
New construction, including new steel plant at Youngstown, opening of new coal mines and work on new blast furnace at Birmingham		1,218,203.44
Stock in sundry companies at cost		547,200.00
New gas pipe lines and prepaid gas leases, prepaid insurance, royalties, etc.		116,730.57
Inventories of raw and finished materials and supplies at market value		4,132,730.04
Accounts and bills receivable		3,008,968.75
Cash on hand		1,203,132.59
Total		$51,369,216.94

Liabilities.

Capital stock issued—			
Preferred	$20,852,000.00		
Less in treasury	545,100.00		
		$20,306,900.00	
Common	$27,352,000.00		
Less in treasury	161,000.00		
		27,191,000.00	
			$47,497,900.00
Current accounts payable			1,823,907.92
Preference dividend No. 4 (paid July 2, 1900)			355,270.75
Deferred installments on purchase of coal lands, payable in six annual payments			214,000.00
Reserve for taxes, relining furnaces, etc.			55,988.35
Profit and loss accounts—			
Net profits for the fiscal period (14 months) ending June 30, 1900, per account annexed	$ 3,643,728.92		
Less seven per cent. dividend on preferred stock	1,421,679.00		
			2,222,049.92
Total			$51,369,216.94

PROFIT AND LOSS ACCOUNT FOR THE FISCAL PERIOD ENDING JUNE 30, 1900.

Profits from the business of the company after deducting all expenses, excepting repairs, renewals and possible loss in collection of outstanding accounts and bills receivable		$ 5,684,100.87
Less amount expended for improvements, renewals and repairs and deduction for depreciation of plants	$ 893,013.89	
Amount deducted from ledger values for depreciation in raw and finished material on hand	1,097,358.06	
Reserve for possible loss in collection of outstanding accounts and bills receivable	50,000.00	
		2,040,371.95
Net profits for 14 months		$3,643,728.92
Dividends on preferred stock declared during first fiscal period		1,421,679.00
Net surplus after providing for dividends on preferred stock		$2,222,949.92

The craft built by Percy & Small, Bath, Me., since they started in business in 1894, are the Chas. P. Notman, 1,518 gross tons; Wm. H. Clifford, 1,594 tons; S. P. Blackburn, 1,757 tons; Alice E. Clark, 1,622 tons; M. D. Cressey, 2,115 tons; Helen W. Martin, 2,265 tons; and the William C. Carnegie, 2,663.99. The Notman, Clifford, Blackburn and Clark are four-masters, the Cressey, Martin and Carnegie, five-masters. Their aggregate tonnage is 13,534.99. Percy & Small have under construction the big six-masted schooner of 5,000 tons carrying capacity which is to be commanded by Capt. L. W. Jewett, and a five-master about the size of the Carnegie for Capt. Hodgdon of Boothbay.

The North German Lloyd, which already maintains a tug and lighterage service between Bremen and Hamburg, is about to establish a similar connection between Bremen and Lubeck via the Elbe-Trave canal.

BRITISH SHIPPING IN 1899.

From Syren and Shipping, London.

For those who take kindly to the perusal and study of blue books we would recommend a course of the annual statement concerning navigation and shipping, recently published by the board of trade. The volume is both bulky and interesting, and contains data which throw a valuable light on the conduct of British shipping. The total entrances at United Kingdom ports were 359,821 vessels of 105,188,504 tons, against 358,030 vessels of 100,547,373 tons during 1898. The clearances also show an increase, being 356,079 vessels of 104,159,577 tons, against 355.107 vessels of 100,300,683 tons cleared during the previous year. But, in spite of this marked improvement, sailing ship tonnage shows a falling off, for while the entrances and clearances during 1897 were 13,153,077 and 11,962,412 tons respectively, they fell during 1899 to 10,193,109 and 10,087,-141 tons. While it is gratifying to notice that the shipping trade, as shown by entrances and clearances, was relatively brisk, it is by no means so pleasing to observe the growing part which foreign merchant shipping plays in the trade conducted at our ports. For the past three years the entrances and clearances of British and foreign ships were as follows:

Year.	British tonnage.	Foreign tonnage.
ENTRANCES.		
1899	32,864,524	16,011,394
1898	31,856,934	13,268,410
1897	32,191,459	12,731,870
CLEARANCES.		
1899	32,784,465	16,122,504
1898	32,359,794	13,478,828
1897	32,235,086	13,040,448

Thus it will be seen that the pushful foreigner is securing a large and increasing share in our foreign trade. The mercantile nation which appears to do most business with British ports is Norway. The tonnage of Norwegian vessels engaged in the foreign trade and entering or clearing with cargoes and in ballast United Kingdom ports in 1899 aggregated 7,442,597 tons. Next comes Germany with 5,238,057 tons. Forty years ago German tonnage trading to or from our ports totalled 2,314,255 tons, while the Norwegian was 1,456,764 tons. After the Germans come the Dutch with 2,950,447 tons. In 1860 the Dutch total was but 567,390 tons, so that here, too, substantial improvement has been made. The contrary, however, is the case with the United States. In 1860 just upon 3,000,000 tons of American shipping entered and cleared our ports, while during 1899 the total was only 569,979 tons, a falling off which the enterprising citizens of the States are doing all they can to check. The entrances and clearances of Danish ships were 3,375,632 tons; Swedish, 3,318,000 tons; French, 2,500,000 tons; Spanish, 2,000,000 tons; Belgian, 1,500,000 tons, and Russia, 903,547 tons only. The oft propounded query: Which is the principal British port? may be answered in various ways, according to the data selected as the basis of comparison. If we take entrances and clearances, both coastwise and foreign, as affording an index of the business done at a port, then London comes out an easy first, as the following list shows:

Port.	Total tonnage entered and cleared.	Port.	Total tonnage entered and cleared.
London	30,013,490	Belfast	4,994,028
Cardiff	19,385,730	Cowes	4,964,062
Liverpool	18,836,819	Newport	4,909,809
Tyne Ports	16,110,220	Dublin	4,859,451
Glasgow	7,434,854	Bristol	3,080,714
Hull	6,160,739	Manchester	2,299,423
Southampton	5,441,167		

The position of Cardiff is, of course, accounted for by the great number of steamers which resort there for coals. Of the tonnage quoted close upon 9,000,000 tons was in ballast, while at London the total was 7,000,000 tons, and at Liverpool only 3,095,000 tons. Thus, the entrances and clearances of ships at a particular port is by no means an index of the quantity or value of the trade in merchandise. Another method of comparison, which is sometimes adopted, is that of actual shipownery, as shown by the number of vessels registered at the different ports. Following this plan Liverpool is first and Cardiff simply nowhere:

Port.	Sail tonnage.	Steam tonnage.	Total.
Liverpool	681,974	1,531,033	2,213,007
London	234,864	1,404,321	1,639,185
Glasgow	494,727	1,135,443	1,630,170
Tyne Ports	13,269	501,976	515,245
Hartlepools	838	380,650	381,488
Sunderland	7,734	267,036	274,770
Hull	14,785	213,610	228,395

At the close of 1899 there were on the British register 22,368 sailing vessels aggregating 3,178,795 tons, and 12,528 steamers of 7,423,404 tons. Two years previous the sailers aggregated 3,579,477 tons and the steamers 6,836,965 tons. Thus the increase in the latter type of ship is larger than the decrease of the sailers, especially when the greater efficiency of steam tonnage is considered. To man this enormous fleet of merchant tonnage the number of men employed was 244,135. This total includes the home and fishing, as well as the foreign trade. The British subjects employed numbered 174,266; the foreigners, 36,064; and lascars, 33,805. Leaving out the lascar element we have in the home, fishing and foreign trade a percentage of seventeen foreign seamen. But in order to arrive at a fairer estimate of the ubiquity of the foreigner on British ships we can eliminate the fishing crews. The British subjects employed on fishing craft number 22,380, while the foreigners employed are only 333—roughly 1½ per cent. Deducting, therefore, the 22,380 Britishers employed on fishing craft and the 333 foreigners we have 151,886 native seamen and 35,731 foreigners engaged in our coasting and foreign trade, which works out to about 19 per cent. This is disquieting in the extreme and it is a pity that the blue book in question does not show where these foreigners signed on, whether abroad or in British ports. With an increasing foreign tonnage entering and clearing at our home ports it is hardly to be wondered at that the facilities for enabling aliens to enter our merchant service are increasing. A case in point recently came under our own notice. A British ship regularly loaded part cargo at a continental port and came on to her home port to complete. All her deck hands were foreigners. They soon discovered, however, that the current wage at the completing port was higher than at Antwerp, and promptly deserted—to serve, we presume, on board some other British ship at an enhanced rate of pay. There are other instructive teachings in the blue book whose contents we have briefly summarized, and we would commend its perusal to all concerned in the development and conduct of our mercantile marine.

THE GERMAN SHIP BUILDING INDUSTRY.

The report of the commission appointed a few months ago by the German government to inquire into the condition and capabilities of the German ship building industry, with a view to the placing of orders in connection with the great scheme for the renewal of the fleet, contains much interesting, and presumably reliable, information. At the period during which the inquiries were being made about 35,000 hands were employed in the German Baltic and North Sea ship yards. By far the greatest proportion were working in the Baltic district, the ship building trade in that district having (contrary to what has happened in the shipping trade) made much greater strides than in the North Sea district. The six most important Baltic yards alone were employing quite 50 per cent. of the total number of workmen engaged in the whole trade; in the year 1898 they turned out a number of steamers measuring altogether in round numbers 75,000 tons, with a total indicated horse power of more than 150,-000; and last year the vessels completed or still on the stocks in these six yards amounted to about 360,000 tons. The Baltic yards have been busily engaged in the building of war vessels, not only for the Fatherland, but for other countries; the number remaining on the stocks in 1899 (not reckoning those completed in that year) was eighteen for German and sixteen for foreign account, while in the North Sea yards there were only four for German and none at all for foreign account. A comparison of the future capabilities of the industry is afforded by a statement of the number of slipways already existing or proposed to be laid down: in the Baltic and North Sea yards altogether there were, when the inquiry was being made, no less than 106, and 32 new ones were projected. The preponderance of the Baltic yards over those of the North Sea is further shown in the size of the slipways, there being now (or will be in the near future) twenty-one of a greater length than 500 ft. in the former district, while in the latter there are scarcely half so many. The building of war vessels at home had much to do with the progress and development of the German ship building industry, and a further great impetus was given to it by the condition insisted upon in the subvention contracts for the Imperial mail steamship services that all subsidized vessels shall be built in German yards and with German materials. In other directions also these subvention contracts had a stimulating effect, namely in respect of the docking and repairing of vessels at home, and the establishment of a German association for the classification of ships. One of the most remarkable of the facts elicited by the commission was the great progress made in the repairing branch of the trade, which formerly had been almost monopolized by the British yards. The German Baltic yards were the first to be made available for the prompt execution of all kinds of repairs, both of hulls and machinery, by the construction of modern-typed iron floating docks; the number of these docks rose from 9 in the year 1880 to 17 in 1890, and to 27 in 1900. German ship owners, therefore, are now able to dock their vessels in home ports instead of being obliged to have recourse to foreign dry docks. What important adjuncts to the German ship yards the modern iron floating docks have proved is, among things, testified to by some of the extensive jobs effected by their means, such as the lengthening of the subsidized steamers Preussen, Bayern, and Sachsen, which jobs, were it not for the existence of the big German floating docks, would have had to be performed in England or elsewhere abroad.—Fair-play.

REBUILDING THE GUNBOAT MACHIAS.

The commandant of the Charlestown navy yard has received an order authorizing the rebuilding of the gunboat Machias, which is now out of commission at the yard, and commanding that the work be rushed as fast as possible under normal conditions. The total cost of the job is roughly placed at from $60,000 to $75,000, and it will occupy fully four months with a large force employed. The Machias has been in commission nearly eight years, and during that time has been only temporarily repaired. Much of her interior work is out of date, as well as her fittings. The ship has proven her value as a light draught gunboat to police Central American waters, and the department proposes to have her put in fine condition to continue this work.

The hull will be thoroughly overhauled and cleaned, and, finally, after everything else is ready it will be painted. The machinery will be repaired and wherever new parts are needed they will be substituted for the old worn-out pieces. The Machias will probably be a faster ship when the commission whip is again broken out at her masthead than when it was hauled down. The electric light and boiler plants are to be modernized and repaired so that they will be equal to those aboard of any ship of her size. The electric outfit is, of course, not quite up to date, having been installed about eight years ago. An entire new set of boats is to be furnished to the Machias. One of the most notable changes to be made in this ship is the substitution of fireproof wood for the present inflammable wood finish and fittings. This same thing is being done to the Olympia, and is along the most approved lines of construction in the navy. The United States navy was away ahead of other navies in adopting fireproof wood for its ships. All our modern ships are fitted with it, and its value has already been established in actual warfare. It is now being used extensively in foreign navies. Besides being proof against fire, the fireproof wood does not splinter, and here is a great advantage. On ships fitted with the old style woodwork a great many were wounded or killed in action by flying splinters, and this danger is now obviated. Naval Constructor Baxter has been experimenting for months with the several fireproofing processes for the purpose of ascertaining which was the best fitted for use on board our ships. All the finish of the cabins, quarters and wherever ordinary wood is used at present will be fireproofed and the furniture is all to be made from the same materials.

A STUDY IN COMMERCE.

MR. J. C. STUBBS ATTACKS THE ISTHMIAN CANAL PLAN AND INCIDENTALLY MAKES AN ARGUMENT FOR THE UPBUILDING OF THE AMERICAN MERCHANT MARINE.

At a banquet given by the National Association of Merchants & Travelers of Chicago recently, Mr. J. C. Stubbs, third vice-president of the Southern Pacific Railway, delivered an address upon the subject "A Study in Commerce," but which was devoted primarily to an attack upon the Isthmian canal. In this he seems to have taken up the mantle of Huntington, who was one of the bitterest enemies of the canal scheme. Incidentally the address was a powerful argument for the upbuilding of the American merchant marine. The gist of his argument follows:

"The application of steam to marine propulsion was, as everyone knows, an American invention. The adaptation of this new power to navigation was pursued with more rapidity and greater success on the lakes and rivers of America than in England. An American predicted in 1791 that steamships would supercede sailing vessels in the carrying trade between Great Britain and the United States. Some time later an English authority declared that one might as well talk of making a voyage to the moon as of traveling direct from Liverpool to New York by steamship. The first steamship to cross the Atlantic was an American vessel. It sailed from Savannah in 1819. Yet, notwithstanding, beginning practically in 1838, Great Britain turned her attention almost wholly to steam navigation for the Atlantic service, and within a few years reestablished her supremacy upon the ocean, which has since been and is now being maintained with a tenacity of purpose that has grown inflexible by centuries of successful pursuit. With the inauguration of regular steamship service, the establishment of the Cunard line, Great Britain began the practice of aiding its merchant marine by cash subventions, and has ever since continued to do so. This was a reinforcement by government aid of superior natural resources. It was in effect a form of differential duty or discriminative tax against the foreign ship in favor of the British vessel. It certainly was governmental interference with commerce. It was national aid to private enterprise. It was far from reciprocity. The change from navigation by sail to navigation by steam was a serious one to the American merchant mariner. It required, comparatively speaking, enormous capital. In this particular alone, the richer Englishman gained a great advantage. When to this was added the active support and abundant financial aid of the opulent British government, the advantage was greatly multiplied.

"The United States made one feeble effort to meet the steamship subvention policy of Great Britain in the case of the Collins line. It was started in 1848, and while it lasted beat the Cunard line out of sight. It was, however, unfortunate, meeting disaster after disaster. Finally, in 1858, its subsidy having been withdrawn, it was abandoned. The merchant ship owners and builders of the United States had so rapidly outstripped Great Britain in building and sailing wooden ships that, blinded by self-interest, they would not believe that steam or iron could be successfully employed in ocean navigation against their beautiful and superior sailing craft. Even after Cunard and Collins had demonstrated that the iron steamships had come to stay and were bound to become supreme for the short voyages across the Atlantic, they still resisted the mail subsidy form of government aid, and vainly advocated the return to protection by discriminating tonnage and tariff duties. With 1861 came the civil war, the consequent damage to all commerce and industrial pursuits, and the death-blow to the American carrying trade. Eight hundred thousand tons of our best shipping was sold abroad, one-third of the tonnage previously engaged in foreign commerce. In 1866 but 32.2 per cent. of our foreign commerce was carried in our own ships, a shrinkage since 1860 of nearly 52 per cent., yet the volume of commerce had increased one-seventh.

"From 1866 to 1899, accompanying a foreign commerce constantly increasing in volume until it had nearly trebled, there was a reduction of more than 550,000 tons, or 40 per cent., in American vessels engaged in foreign commerce. There was a persistent diminishing ratio of ships in foreign service to population, and a continual lessening of the share carried by American ships, until, as I have said, it has fallen to less than 10 per cent.—lower than at any time since 1879. In 1899 Great Britain's share of the world's sea-going sailing tonnage was more than 33 per cent., while that of the United States was less than 15 per cent. Of the world's sea-going steam tonnage Great Britain owned 58½ per cent., the United States less than 4½ per cent. The total world's sea-going steam tonnage is more than double the total of sea-going sail tonnage by a million tons. Since 1874 the sea-going sail tonnage of every maritime nation, except Norway, has diminished. Norway's has remained about stationary. The decrease has ranged with the principal nations from 40 to 64 per cent. During the same period the sea-going steam tonnage of every maritime nation has multiplied itself from two to fourteen times. The only country which has not in this time at least doubled its fleet is the United States. Our increase was about 68 per cent.

"Admittedly the steamship of large capacity will be the future ocean carrier. The opening of the Suez canal stimulated the demand for steamship service and transferred almost bodily the vast oriental trade from sail to steam vessels. The successful building of a canal through Central America, connecting the Pacific and Atlantic oceans, will accelerate this persevering transfer of over-sea commerce from sailing vessels to steamships. Just here the question pertinently arises: Why should the United States mortgage its revenues or tax its citizens to make a highway for the ships of rival nations?

"Great Britain and Germany are the strongest competitors of the American manufacturer in the markets of the world, and these two nations own more than two-thirds of the world's steam tonnage available to over-sea commerce, while the United States owns less than 5 per cent. Why then should we dig a canal at an outlay of from $150,000,000 to $200,000,000, and hire, as we should be obliged at the present time to do, English, German and French ships to carry our own commerce through it? Will it facilitate our commerce by reducing freights and expediting transit? That is doubtful, indeed is not to be expected so long as we, in order to market our goods, are dependent upon ships owned by our rivals for the trade itself. Is it not true that British carriers, British merchants, British manufacturers and British legislators stand together and cooperate in the promotion of British trade as the classes of no other nation do for its commerce? Hear what the president of the Peninsular and Oriental Steamship Co. said at its annual meeting two years ago: 'Our policy is that of a British company, which is keenly alive to British interests, and I believe in this respect we represent the general feeling of the ship owners of the country.' F. B. Thurber of New York, whom you all know by reputation, says: 'A ship is a missionary of trade. Steamships work for their own country, just as railroads work for their own terminal points. Every ship that goes abroad is an object lesson.' And. I would add, a most attractive advertisement.

"Does it not offend one's notions of the eternal fitness of things that a nation possessing less than 5 per cent. of the world's available tonnage; a nation whose commercial interchange with other countries is scarcely one-tenth of the world's commercial interchange; a nation which carried in its own vessels less than 10 per cent. of its own commerce and less than 1 per cent. of the world's commerce—that this nation should undertake to build a ship canal to facilitate the commerce of the world and the world's carrying trade, while withholding from its own merchant marine the assistance which the shipping industries of other nations receive, and are thereby enabled to command the trade, even American carrying trade? Would it not better accord with business sense, with the commercial precedents and traditions of thirty centuries, were we first to devote our enterprise and wealth to building ships, creating a merchant fleet, whose owners, masters and sailors shall be imbued with a national spirit, to distribute American products and American manufactures to every port in every sea against the products or manufactures of any and every other nation, and to spread American civilization over all lands? Every instrumentality of commerce, every missionary of trade, is an agency of civilization. An expanding commerce means an expanding civilization.

"The rapid increase of American exports is sometimes pointed to as indicating that trade does not always 'follow the flag.' Such skepticism is born of ignorance. The total value of Great Britain's foreign commerce (excluding her colonies) in 1800 was $325,000,000; in 1898, $3,950,000,000, an increase of $3,625,000,000. The total value of the foreign commerce of the United States in 1800 was $82,000,000; in 1898, $1,900,000,000, an increase of $1,818,000,000. Thus Great Britain added $2,000,000 for every $1,000,000 of addition made by the United States. Great Britain's flag has continued to carry the trade. One-half of the sum proposed to be expended by the government to build the Nicaraguan canal, if devoted to aiding the building of a fleet of merchant vessels, being distributed in annual installments over ten years, would bring a surprising return, quite equal to that of the governmental investments of land subsidies and money advances to the Pacific railroads, whose political, military, industrial and commercial benefits to the country at large are incalculable. The saving on freights alone would range from $10,000,000 to $175,000,000 per annum of money that now goes to foreign ship owners, which would then be earned by American ship owners and retained at home.

"I do not say that an American isthmian canal may not and should not, in the fullness of time, be constructed, and constructed and controlled also by this government, but I submit that now is not the time, nor will the time ever come until this nation shall build and place upon the waters of the world a fleet of merchant steamships that in number, in symmetry and speed, in capacity and economy of service, shall excel those of Great Britain today, as the Baltimore clippers and American liners surpassed the British ships in the early part of the century. I believe, with Secretary Gage, that this record must be improved; that national progress, national protection, national pride, demand that the one dark spot on the first century's record of America's growth shall be obliterated."

THE TRADE WINDS.

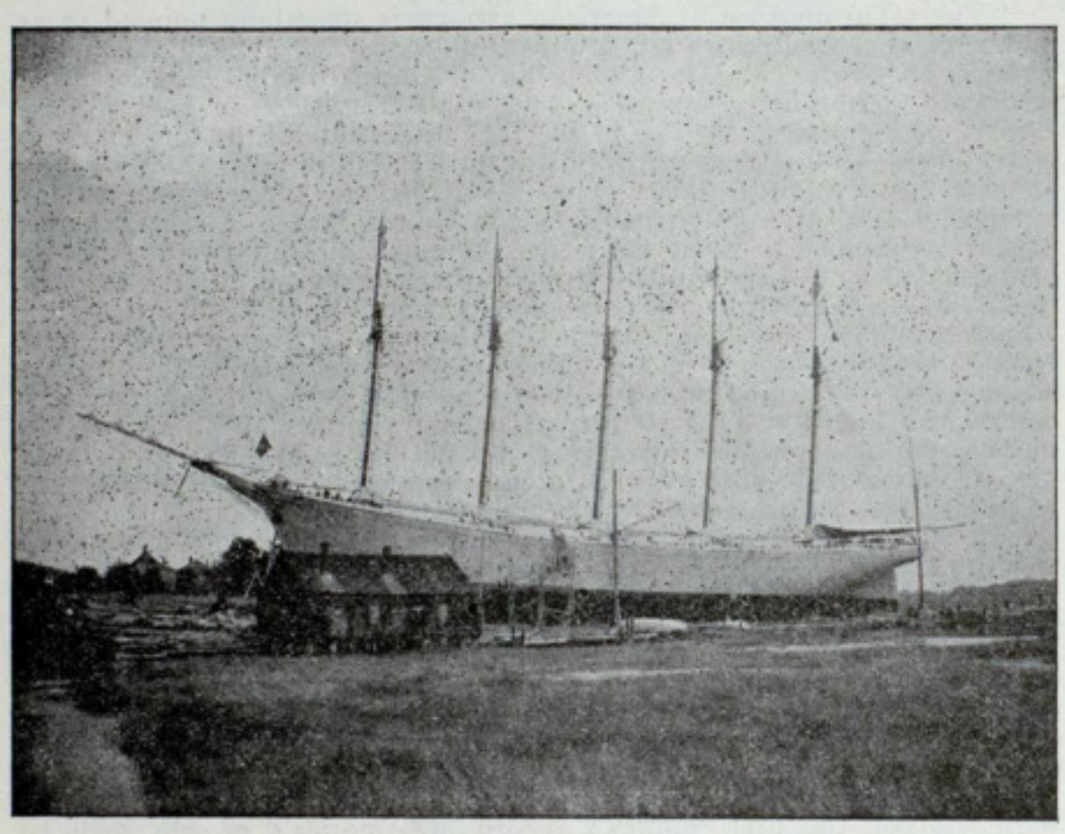
The explanation of the cause of the trade winds is simple enough, and yet there are but few sailors, and even but few masters, that "go down to the sea in ships" that can clearly explain the "why" and "wherefore" of the trade winds. The first cause is the rotation of the earth, but this is only a partial explanation, for the atmosphere has long ago made it take the motion of the earth, as if it was bound to it by some invisible thread. But it is not wholly so bound, as we shall presently see. At the equator the earth is spinning from west to east at a speed of something over 1,000 miles per hour, while at the poles there is no motion like that at all and the speed of rotation varies with that of the distance from the equator. It follows that the air which is in the latitudes north and south of the equator travels at a less rate of speed than does the air at the equator. In latitude 75 degrees north, for example, the air travels at the rate of 268 miles per hour as against the thousand or more miles at the equator. Now, as the earth is warmer in the torrid zone lying immediately on each side of the equator, the result is that the air also is warmer, and as hot air always rises, something else must come in and take its place. This is actually done by the inrush of the cool air from the north and south, whereby a constant circulation of the atmosphere is caused; the hot air at the equator rising into the cool regions above and being carried north and south from the equator, and getting cooler the further north or south that it travels, until it comes down to the earth again, because cool air is heavier than warm air, and then rushes back toward the equator to restore the equilibrium, and so on forever. The mighty energies of the sun keeps up this motion by continually pouring its rays and heat down upon the torrid zone, raising the hot air, which then flows towards the poles, and after being chilled returns again to the equator. So we have, therefore, four mighty air currents, two above and two below. The two above flowing away from the equator because they are lighter, the two below, being composed of heavier air, flowing south and north toward the equator. Consequently the sailor in latitude 30 degrees north, for example, feels a strong and steady northwest wind. It has its north in it because it is coming from the north, pulled by the vacuum of the tropics. It has its westerly tendency, because the earth is turning faster to the east than the air. The actual direction of the current is south, but the earth-spin gives the semblance of an easterly wind, just as on a railroad flat car we always feel the breeze from the direction in which the train is moving. The combinations of these motions, real or apparent, give rise to the northeast and southeast trade-winds, and they are as eternal as the sun, by which they are caused, and by the rotation of the earth because they depend upon it.—Coast Seamen's Journal.

FIVE-MASTED SCHOONER WILLIAM C. CARNEGIE.

The five-masted schooner William C. Carnegie, recently launched from the ship yard of Percy & Small, Bath, Me., for J. S. Winslow & Co., Portland, Me., is the queen of the fleet of five-masters of the American coasting trade. Her lines are fine, she is larger than the largest sailing ships of 15 years ago and is equipped with every appliance which mechanical ingenuity can suggest for sailing ships. During the past two weeks she has been the center of an admiring throng in Bath. The schooner is 270 ft. on the keel, 289 ft. on the measuring line; 300 ft. over all; 46 ft. 3 in. beam; 22 ft. 4 in. deep; 2,663 tons gross, 2,380 tons net. Her carrying capacity is 4,500 tons. A brief description of the vessel has already been given in the Review.

The keel is 15x26 in. of birch. There are five tiers of keelson and three tiers of sister keelson, all 14 in. square. The ceiling is yellow pine in lower hold up to lower deck beams with 12x14; three full sets of hanging knees, 10, 11 and 12 in.; has spar deck forward in hold with hanging knees and lodging knees. The lower deck beams are 13 in. square. She has three streaks 14x14 between decks waterway, also two heavy lock streaks, 12x14, locked down over beam, and heavy stringers 11x14, one locked up and one locked down on lower deck and two of the same on the upper deck, 10x14, which run the extreme length. The upper deck beams are 11x13 with 12x12 waterways, two lock streaks inside of waterway 10x14. She is ceiled clear to the rail with 9x14 yellow pine from stem to stern and thoroughly edged bolted. The decks are yellow pine. The upper deck is 3½ in. square. The poop deck beams are 7x13.

The frame is selected hard wood, topped with hackmetack. She is square fastened, edged-bolted every frame, locust treenails and composition butt bolted on the outside. The heavy frames are additionally strengthened by twenty-five steel straps 4x⅝ from stem to stern on each side, running on an angle of about forty-five degrees from the upper



FIVE-MASTED SCHOONER WILLIAM C. CARNEGIE, BUILT BY PERCY & SMALL, BATH, ME.

streak of clamps to short floor head which bind the timbers into one unyielding whole, while the heavy clamps, likewise bolted "through and through," complete the arrangements for securing the greatest possible strength for the hull. The three sets of massive deck beams are of yellow pine, covered with selected plank, which give a deck of remarkable beauty, while the seven large hatches permit the most rapid loading and discharging of cargo. The main rail is 6x15 and an 8x12 inside of that locked down, the two edged-bolted together. The masts are magnificent sticks of Oregon pine, the short booms and gaffs are spruce and fore top and jib booms are hard pine.

The lower masts are 118 ft. long, 30 in. in diameter; topmasts, 56 ft. The fore is 21 in. in diameter, the other four 16 in. The bowsprit is 52 ft. long, 30 in. in diameter, jib boom, 75 ft., 20 in. in diameter. Spanker boom, 86 ft., 20 in. in diameter; four short booms, 48 ft. long, 15 in. in diameter; staysail boom, 36 ft.; boom on jib, 31 ft. There are five working gaffs. The spanker is 56 ft., 14 in. in diameter; the others 45½ ft., 13 in. in diameter. She will spread 10,000 yards of canvas. The standing rigging is all of the best galvanized wire, the running rigging is Plymouth cordage manila.

The vessel has two patent Baldt stockless anchors weighing 8,500 lbs. each; carries 225 fathoms of 2⅜-in. chain. Has Hyde engine and windlass, steam capstans, two great steam wrecking pumps and a set of Adair fly wheel pumps, also a steam winch just aft the fourth mast for hoisting cargoes and sails, the first to be placed on a sailing vessel, are among the equipments. The poop deck itself is longer than the schooner of a few years ago. The mechanical appliances enable her crew of twelve men to handle more easily than the old clipper could be handled by her crew of thirty-two men.

The quarters for the crew are finished in yellow pine, and are light, airy and steam heated. The galley is a midhouse with walls finished in natural woods, with a kitchen equipment to delight the heart of any housewife, while the cabin is one of which any captain would be proud. Finished in quartered oak and mahogany, furnished with mahogany upholstered in brocaded plush, lighted by large and decorative skylights and heated by steam radiators, it permits of no improvement. The captain's room is 25 ft. in length, furnished with handsome roller-top desk, folding chart cabinet, and every convenience for the navigator, while instead of the old-time berth, there appears a prettily wrought "four poster" of mahogany hung with flowing draperies of lace. On the port side of the main cabin are two elaborately furnished spare staterooms, forward of which is the first mate's room. The bath room is unusually large, while the captain's pantry is the delight of the steward. From the improved steering gear to the imported side-lights the vessel has been equipped with the best fittings to be procured and is easily queen of the Atlantic coasting fleet.

The Carnegie was built for general coastwise trade, and is named after William C. Carnegie of Pittsburg, a nephew of Andrew Carnegie. She was designed by F. W. Rideout.

PORT TO PORT COMMERCE.

A NEW DIVISION OF STATISTICS SHOWING MOVEMENT OF VESSELS AND FREIGHT ON THE GREAT LAKES.

The following bulletin of a new division of statistics, devoted to the port to port commerce of the Great Lakes, has just been issued by the treasury bureau of statistics as follows:

The commerce of the great lakes is making its highest and most elaborate record in the year 1900. Not only is the business carried on the lakes greater during the present season than on any other occasion, but for the first time its details are being accurately measured and the facts presented from month to month to those interested in those details. The very rapid growth in the commerce of the great lakes which has been measured only at one or two points, and that in a fragmentary way, has for many years suggested the importance of some method by which the details of this enormous commerce could be measured and the shipments to and from each of the great ports of these lakes recorded. For several years the war department official at the Sault Ste. Marie canal has made an accurate record of the shipments through that passage-way, which connects Lake Superior with the lower lakes, and statements have been made from time to time of the tonnage of vessels passing that point. But, aside from this, no definite information has been had regarding the commerce of the lakes as a whole or of the business of the various ports in the various articles entering into the business of that great highway of commerce which connects the producing with the manufacturing and consuming sections of our country. In 1899 the matter was seriously taken up by the bureau of statistics of the treasury department and a system devised by which this information could be obtained, showing the receipts and shipments of every port in all of the important articles entering into the commerce of the lakes, and at the beginning of the present season this system was put into operation and is proving effective and satisfactory to all interests.

The statistics just compiled, and which form a part of the July summary of commerce and finance, show that during the month of July 5,385 vessels arrived at the thirty-seven principal ports on the great lakes, and from the opening of navigation up to Aug. 1 the total number of arrivals was 15,941. The proportion of the water transportation interests of some of the cities on the great lakes is also strikingly illustrated. For instance, there entered the port of Chicago during the month of July, 1,108 vessels, or an average of thirty-six vessels per day. From the opening of navigation in April to Aug. 1 the vessel arrivals at Chicago aggregated 3,518. In the July record Cleveland ranked next to Chicago, there having been 533 arrivals during the interim, but for the season to date both Milwaukee and Buffalo outclass Cleveland, the total arrivals at Milwaukee being 1,599 and at Buffalo 1,355, as compared with 1,336 arrivals at Cleveland. The port of Detroit was entered by 275 vessels during July and there were 944 arrivals at Duluth, Minn., and 439 at West Superior, Wis., her sister city at the head of the lakes.

There has been considerable discussion of late of the report that the railroads were taking from the lake carriers a greater proportion of Northwestern grain shipments than ever before. It would appear, however, from the latest statistics, that the inroads are less serious than supposed. The receipts of breadstuffs at the principal ports on the lakes are as follows:

Articles.	July, 1900. Bushels.	Season, 1900 to Aug. 1 Bushels.
Wheat	1,184,073	16,743,620
Flour (tons)	25,528	333,612
Corn	11,043,583	29,638,915
Oats	4,116,455	16,040,389
Barley	239,523	2,387,423
Rye	78,425	946,156

The statement just compiled also refutes the popular fallacy that the water transportation of grain in the great lakes district constitutes almost exclusively a direct traffic between Chicago and Buffalo. In the shipment of flour the ports of Duluth and Milwaukee are practically equal, the shipments at each port thus far this season having exceeded 100,000 tons. In shipments of wheat Duluth is far ahead of all other ports, having shipped 1,014,193 bushels in July and 8,268,886 bushels during the season up to August 1. The neighboring port of West Superior, Wis., stands next to Duluth, having shipped 1,911,649 bushels during July, and 5,239,051 during the season. Chicago heads the list in corn shipments, her total for July being 6,533,526 bushels and for the season 24,421,335 bushels. In shipments of barley and oats Milwaukee leads, while in shipments of rye Duluth holds first rank. Although originating at numerous different ports, the great bulk of the lake grain trade converges at Buffalo as a point of discharge. For instance, of the 16,743,000 bushels of wheat received at all lake ports, 14,217,441 bushels were consigned to Buffalo, which port also received 23,975,796 bushels of the aggregate of 29,638,915 bushels of corn arriving at all ports. The iron ore traffic is a branch of lake traffic in which the greatest interest is felt this year by all persons connected with the iron and steel industry. Thus far this season, the total receipts of iron ore foot up 7,890,069 tons, 1,869,721 tons being received at Ashtabula, 1,422,327 tons at Cleveland, and 1,154,465 tons at South Chicago during the season; while the principal ports of shipment were Two Harbors, with 1,770,842 tons, and Duluth, with 1,690,935 tons.

There was launched at Nixon's Crescent ship building yards at Elizabethport, N. J., last Friday, a new fire-boat, the William S. Grattan, for the city of Buffalo. The boat will cost $91,000. It is a steel hulled vessel, 118 ft. in length, 24 ft. deep and has a draught of 14 ft. Besides the fire-fighting apparatus, the boat will have an ice-breaking prow, to be used during the winter months on Lake Erie.

WITH THE ATLANTIC COAST BUILDERS.

It is expected that the new steel floating dry dock for Algiers, La., now under construction at the Maryland Steel Co.'s yard at Sparrow's Point, Md., will be completed within a few weeks.

John H. Dialogue & Son, of Camden, N. J., usually have in stock machinery and sometimes a tugboat for sale. They are at the present time building a steel hull tugboat 153 ft. long, which will be for sale when finished. She will have two boilers, triple expansion engine, large bunker capacity, and be first-class in every respect.

H. M. Bean of Camden, Me., will commence work on a four-masted schooner as soon as the material can be obtained. It will be a small one, about 175 feet on the keel. He may build her for Capt. Crowley. Although the contract is not made, negotiations are now in progress. If Capt. Crowley takes this one Mr. Bean will build a four-master for himself to engage in the Cuban and Porto Rico trade.

Orders for Drein's patent beaded galvanized steel metallic life-boats and life-rafts are coming in from all points. They have shipped this month twenty 26-ft. patent beaded steel life-boats and eighteen sea life-rafts for ocean steamers, and a number of 18, 20 and 22-ft. life-boats for river steamers. For tugs in New York harbor they have built life-boats all the way from 12 to 22 feet long.

It is understood that the ship building firm of William A. Boole & Son of San Francisco are contemplating locating at Seattle, Wash. They had intended going to Oakland, but were unable to secure a definite title to the property. One of the principal objects of the firm in going to Puget Sound is to be in close proximity to timber for ship building. The company proposes to put in, besides their present plant, a modern marine ways.

The steel tug Spartan, built by the Neafie & Levy Ship & Engine Building Co., Philadelphia, for Frank W. Munn, a well-known tug and barge owner, was launched recently. The vessel was christened by Miss Florence Munn. The Spartan is a sea-going craft, built to withstand the stormy weather frequently encountered off the coast during the winter months. She is to be particularly used in barge towing. Capt. Chandler, formerly of the tug Sea King, will command her, and when in service will equal any boat of her size on the coast.

The new double-decked pier of the Baltimore & Ohio railroad at Philadelphia, situated at the foot of Jackson street, and the only one of its kind on the Delaware river front, is rapidly nearing completion. The pier is located northward of the company's coal pier, with a 150-ft. wide dock between them, and extends in length 675 ft. to the new Port Warden's line, with a uniform width of 135 ft. The pier is covered with a double-decked shed of timber, with corrugated iron sides and slag roof, 585 ft. long and 129 ft. wide.

William R. Osborn, the ship builder, at Croton-on-Hudson, N. Y., has just completed two vessels. One was a high pressure tugboat, which was built for the Richmond Phosphate Co. of City Point, Va. She is 40 ft. long, 10 ft. beam, and 4 ft. depth of hold. She is equipped with an engine with an 8-in. cylinder by 8 in. stroke, and steam is generated in a vertical boiler. The tug has gone to her new home port via the inland route. The other boat just completed is a cutter, which has been sent to her owner, M. J. Wilcoxson, at Catskill, N. Y. She is 35 ft. long, 10 ft. beam, and 5 ft. depth of hold. She draws 4½ ft. of water.

Gen. Sumner, the latest addition to the Boston fleet of ferryboats, was given its trial trip last week by the contractors, William McKie, and the Atlantic Works. The test of the new boat, which is modern and of the latest improved type in every particular, was perfect in every way. Fourteen statute knots were made, the new boat running very smoothly without the slightest vibration.

The Gen. Sumner is of the double screw type of boat, and is designed similarly with the Noodle Island and other late boats. She is 164 ft. 3 in. over all, with 57 ft. of beam over guards, and 37 ft. of beam over plank. She has 14 ft. 1 in. depth of hold. Her engines are of the vertical inverted, double compound 4-crank type. There are two high pressure cylinders of 14 inches diameter, and two low pressure cylinders of 28 inches diameter, giving a stroke of 24 inches. The boilers are of the gunboat type. The cabins are finished and ornamented much in the same manner as the other modernly equipped boats.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of September 5, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire	36⅞	37⅜	36¼	36¼
American Steel & Wire, Pfd	75½	76¼	75½	75½
Federal Steel	35⅜	35½	34⅞	35
Federal Steel, Pfd	67	67⅛	67	67
National Steel	27½	.....	.....	27½
National Steel, Pfd	86	86	85	85½
American Tin Plate	29¼	.....	.....	29¼
American Tin Plate, Pfd	80¼	.....	.....	80¼
American Steel Hoop	20¼	.....	.....	20¼
American Steel Hoop, Pfd	67½	.....	.....	67½
Republic Iron & Steel	13	.....	.....	13
Republic Iron & Steel, Pfd	54⅞	55	54½	54½

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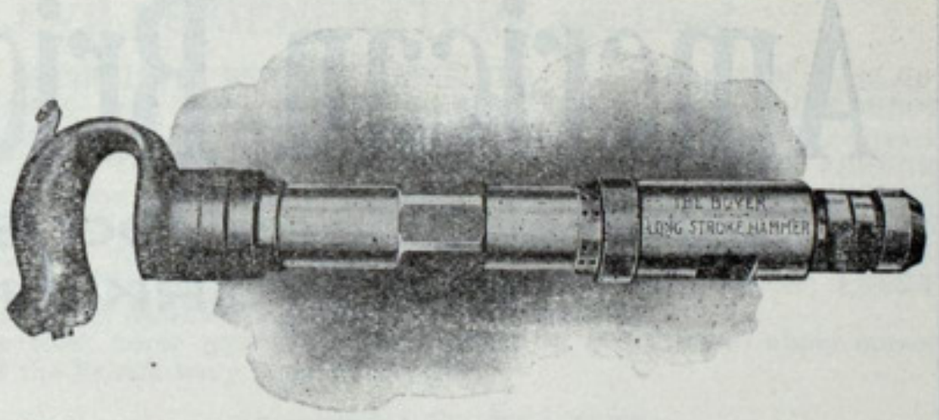

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COMMERCIAL ORIGIN OF THE DORY.

(From the Amesbury, Mass., News.)

Perhaps there will be no dispute that the "wherry" or "dory" as it is now called, had its commercial origin in the old town of Salisbury, in that part of the town known as the "Point" on the Merrimac river, and which was made a part of Amesbury in 1886. There may have been isolated instances of boats answering the description built elsewhere, but not in any number. The fathers of the industry were Lowells, a family noted from the time of William the Conqueror. In this country the descendants of Percival Lowell have been noted pastors, poets, statesmen, doctors and artisans for many generations. Those descended through the John Lowell branch include such men as Judge John Lowell (1743-1802), the Hon. John, Jr., founder of the Lowell Institute of Boston; the former ambassador and poet, James Russell Lowell, and many others, distinguished in almost every walk of life.

The Lowells of Amesbury and Salisbury, of whom there are several generations of boat builders, descended from Richard, the second son of Percival and Rebecca Lowell, born in England in 1602 and coming with his father to Newbury, Mass., in 1639, dying in that town in 1682. Gideon Lowell of Amesbury, of the fifth generation, was a mariner, but is said to have built a few boats of the "wherry" pattern; but it was Simeon, of the sixth generation (1745-1830) and his sons, Stephen and Benjamin, who really inaugurated the industry. The "wherry" was known in England at the time of Shakespeare, but that was probably a round and not a flat bottom boat. There are many kinds of light boats, but none takes the place of the dory as an all around boat. Being flat-bottomed, they are available for shoal places and are easily landed; they are of light weight and can be carried almost as well as a canoe; they are the only available boat for fishermen on the banks and shoals; they can be put to sea through a surf which would swamp the regulation life boat; and as they have greatly bevelled sides, and are sharp both fore and aft, they displace very little water and are easily propelled by either sail or oar.

It was about 1790 when Simeon Lowell and his sons commenced to build wherries, or dories, at Salisbury Point. The small boats most in use prior to this time were "jolly" or "long" boats, and boats similar to a whaleboat, used at the mouth of the river and known as "Joppa shays." But it was not until the business passed to Simeon's sons, Stephen and Benjamin, that it assumed the proportions of a distinct industry. In those days everything pertaining to the manufacture was in a very primitive state. All the knees or timbers had to be gotten out by hand in the woods and as there were no planing mills all the boards were planed by hand. The bottom boards were not of pine, as now, but of hard wood, and the bottoms were trunneled (treenailed) to the timbers, like the planking of ships. Of course this was a clumsy method of construction, but it was strong and buyers insisted that trunnels should be used. The few clinching nails obtainable were hard wrought and purchased of one Lane of Seabrook, N. H.

Such a thing as painting a boat was unknown in those good old days. Like Noah's ark, they were "pitched within and without." A liberal coat of tar was applied to the bottoms inside and out and up the sides as far as the seats, the remainder being coated with spirits of turpentine, which dried on like varnish. Daniel M. Lowell of Salisbury Point, a direct descendant of Simeon and the oldest living expert boat builder hereabouts, recalls all these features of the dory which he has lived to see built in a way which combines lightness with strength, with copper rivets and many other accessories which would have been thought extravagant in the old days. He tells of some Salem parties who had some of the old tarred boats built for public purposes, who thought that a fancy touch ought to be given them by a little paint in the stern sheets, where the officials were to sit. In the old times it used to be considered a stint for one man to build a dory in six days. Nowadays a gang of three men with every convenient material and facility at hand will easily put together three a day, exclusive of "timbering," the skeletons (bottoms timbered) being furnished by workmen during that part of the business separately.

The timbers now in use are all "patent," consisting of two pieces of oak fastened together at the proper angle by an iron clamp. These timbers were invented and subsequently improved by David True of this town about twenty-five years ago and immediately supplanted the old natural knees and have since been used by the thousands. There are five sets, or ten timbers in the largest size boats, which are 15 ft. on the bottom and about 19½ ft. over all. The local supply of knees of course ran short after a term of years, and prior to the advent of the "patent" timbers the supply came from New Hampshire, being hauled down over the road.

The first fishing dories sent to Boston were consigned to A. Winsor, in about 1830. About 100 a year were soon after sent to Lynn for shore fishing and a few to Beverly, Marblehead and Cape Cod. E. B. Phillips of Boston was also an early consignee. The earliest Gloucester consignees were Sinclair & Low. After this the trade became general, and Provincetown, Truro and other Cape towns, and even the provinces, enhanced the demand. The old firm of Daniel Lowell & Son (D. M. Lowell) built many boats for Swampscott and Hiram Lowell for the Marblehead trade. Thirty years ago there were many firms of boat builders at Salisbury Point, including Hiram Lowell, Lowell (D. M.) & Kensington (J. W.), W. C. Morrill, Ezra C. Morrill, George H. Morrill, W. D. Lowell and Stephen Lowell. Together they cut up about 600,000 ft. of lumber. Today there are only three shops, those of Hiram Lowell & Son (F. E. Lowell), Stephen Lowell (E. M. Lowell) and Percival M. Andrews. The first named builds the bulk of the fishing dories which go to Gloucester, although E. M. Lowell builds quite a number. The most of the trade outside of Hiram Lowell & Son's shop is, however, in fancy skiffs and pleasure boats, which are to be found on almost every New England lake and river, and as tenders for small yachts all along the coast. The total output of these firms and of Ernest Averill, who builds a few skiffs, is about 2,000 boats, possibly somewhat more. H. Lowell & Son alone build 1,500 and cut up 300,000 ft. of lumber in their construction and employ about a dozen men.

The dory most familiar to Bostonians is probably the "Swampscott" dory, which is built especially for pleasuring. It differs from the "Salis-

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bury" variety in having wider sides, flaring more on the bottom streaks, and tumbling in more on the upper, and in being narrower, both fore and aft. Most of these are built at Swampscott, only a very few of the pattern ever having been built here. The "Salisbury" (Amesbury) skiff is familiar on all the rivers and lakes, and is admirably adapted for pleasuring and fishing. It is not confined to stated measurements, but may be varied in width, etc., according to order. It has a square stern, but the bottom is well turned up aft, so there is very little dragging of water, and many are built very sharp forward. The output varies from 100 to 300 per season. A large number have been built during the present summer.

KEEL OF CRUISER DES MOINES LAID.

The keel of the United States cruiser Des Moines, which is one of the six cruisers of the Denver class, was laid down last week at the yards of the Fore River Engine Co. at Quincy Neck. There were no ceremonies attending the laying of the keel.

The Eastern Dock & Construction Co., which is the name of the company's new plant, has been in existence as such only since spring. Owing to the desire of the company to enter into competition for the building of government boats, and the narrowness of the river at Braintree, it was decided to move farther down the river, where boats of any size could be launched. An immense amount of property was bought at Quincy Neck and work improving it was immediately begun. The company had the contract for building the cruiser before it was decided to purchase the land at the neck, and the first work done as soon as the transfer was made was to start a steam shovel in operation to hollow out a place for the keel of the ship. This was done some time ago, and the builders have been waiting for the keel plates for several weeks. The property of the company has undergone a wonderful transformation since work was first begun there, and to-day the grounds are covered with immense buildings and machinery of the most gigantic pattern. The officials of the company are to make bids for all classes of government work from a battleship to a torpedo boat.

The construction of the Des Moines will represent a radical departure from previous practice in the building of cruisers in this country in one respect at least, that of having a steel hull sheathed and coppered. For many years Chief Constructor Hichborn has advocated sheathing steel ships' bottoms, but he has met with considerable opposition. During the session of congress in 1899 all of the 12 ships authorized at that time were ordered sheathed and coppered.

The new cruiser will be of about the size of the Raleigh and Cincinnati, but the models of those ships will be improved upon and modernized. The Des Moines will be 292 ft. long on the waterline, and her extreme length will be 308 ft. 2 in. The extreme breadth will be 43 ft., the mean draught at trial displacement, two-thirds coal, ammunition and stores, 15 ft. 6 in.; the extreme draught, fully loaded, 16 ft. 8 in.; trial displacement, 3,100 tons; full load displacement, 3,400 tons; coal carried on trial trip will be 470 tons. The total bunker capacity will be not less than 700 tons, and the ship will have to make at least 16½ knots on her trial trip. The Des Moines will be propelled by four vertical inverted engines, triple expansion, with an estimated horse power of 4,500. Six water tube boilers will furnish the steam.

The batteries of the ship will be as follows:

Main battery—Ten 5-in. 50-caliber breech-loading rapid-fire guns.

Auxiliary battery—Eight 6-pounder rapid-fire guns, two 1-pounder rapid-fire guns, four machine guns.

The guns will all be designed for smokeless powder, and the 5-in. guns will be more effective than the old style of 6-in. guns.

The cruiser will have sail area of about 6,000 sq. ft. and her coal capacity will carry her at full speed about 2,600 miles. At the most economical rate of speed, about 10 knots an hour, the vessel will be able to steam 9,800 miles without recoaling. The cruiser will carry 250 rounds of ammunition for each of the 5-in. guns and 500 rounds apiece for each of the smaller guns. All of the propelling machinery, the steering gear and magazines, will be below the water-tight deck. The rig will be that of a two-masted schooner, with signal yards on the foremast.

The Des Moines will have two searchlights, an electric signaling system and a complete electric lighting plant. She will have a complement of twenty-seven officers, 238 seamen and twenty-five marines. According to a decision by the naval board, reached after the original plans had been prepared, the Des Moines will have a two-inch nickel steel protective deck. The boat will cost $1,065,000 and will be finished within 30 months.

The fireboat Clevelander of the Cleveland fire department has gone out of commission for ninety days. Meanwhile extensive repairs will be made to her hull and machinery.

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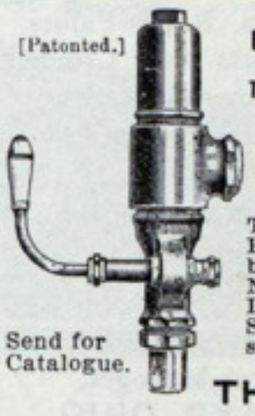

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RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PALLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACCHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGU**, battleships.

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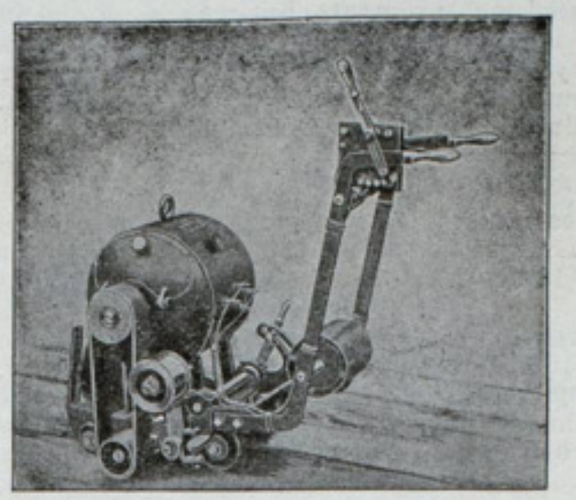

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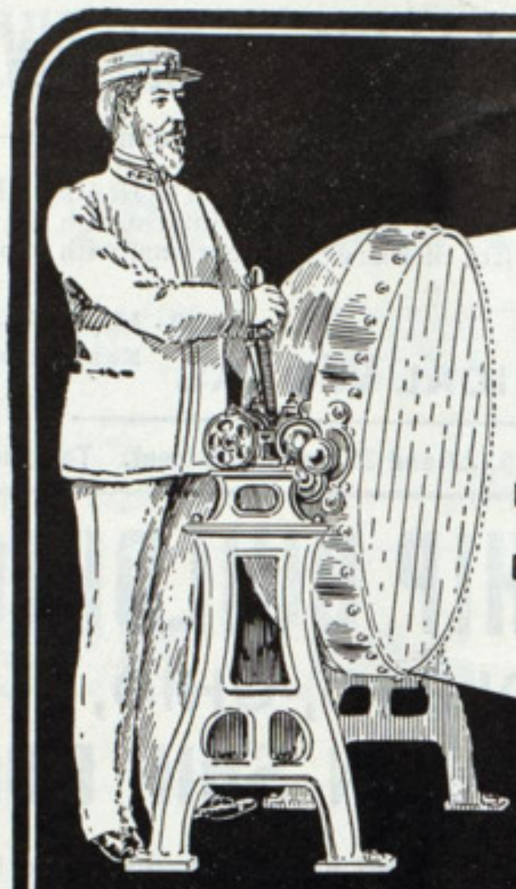

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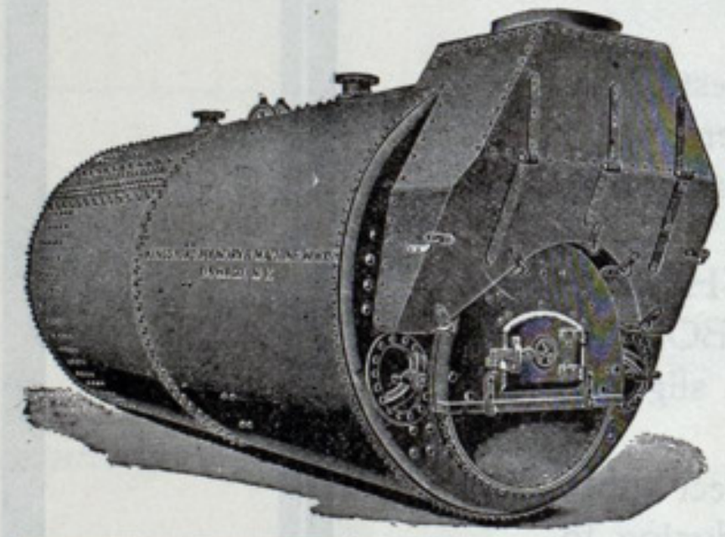

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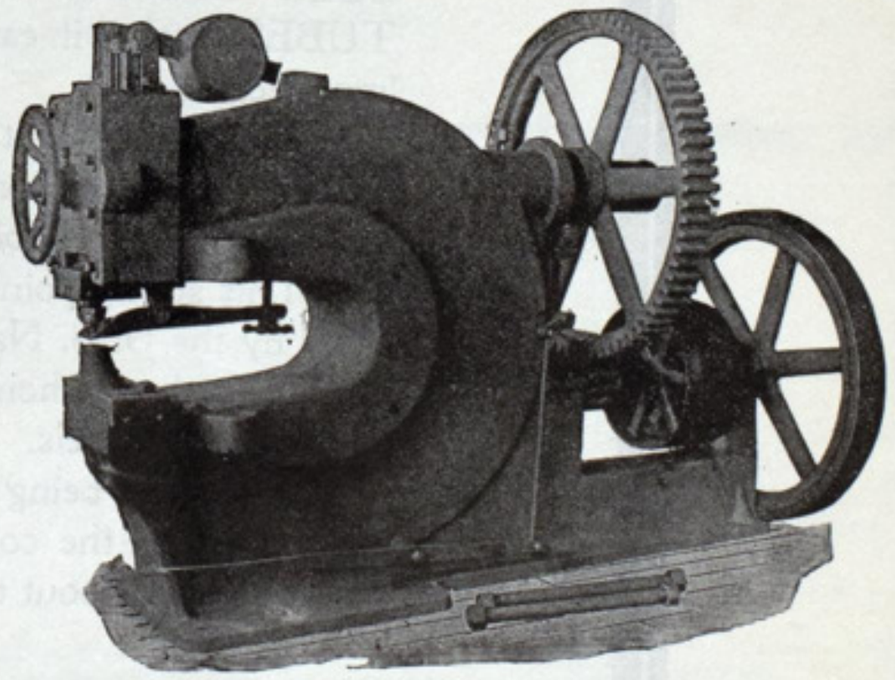

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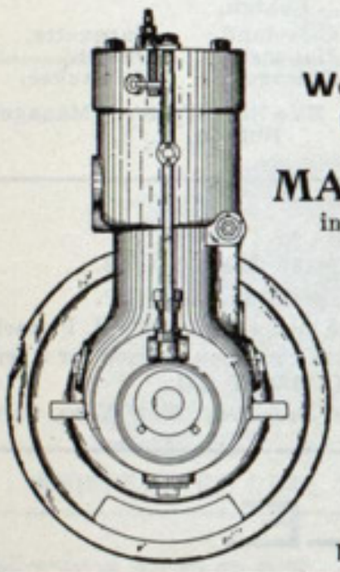

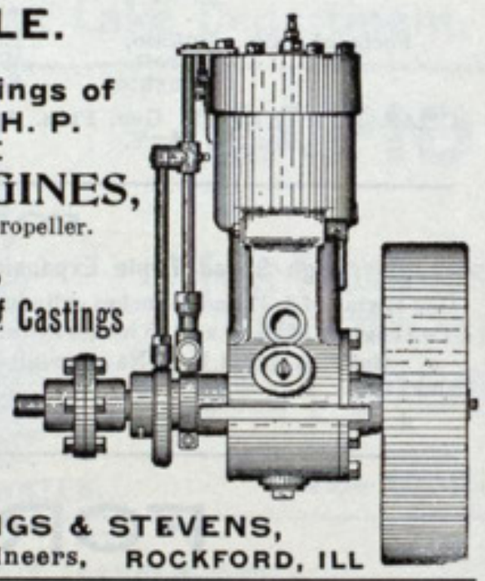

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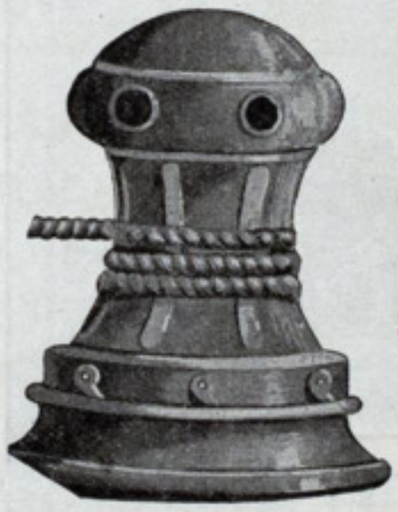

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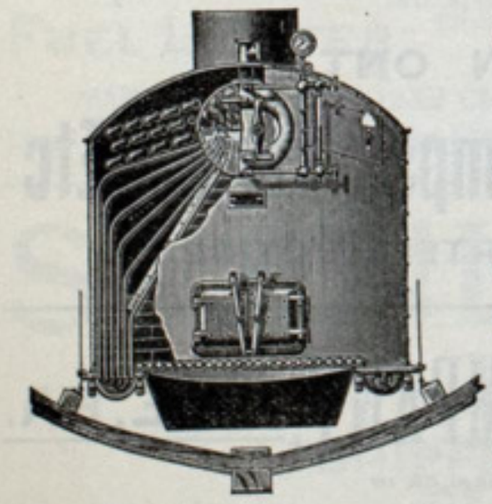

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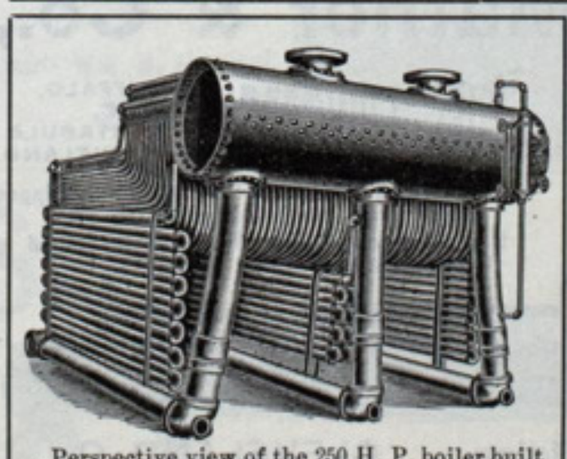

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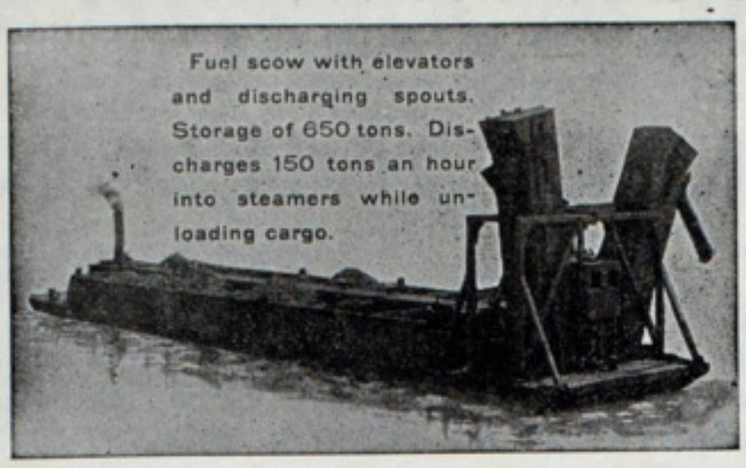

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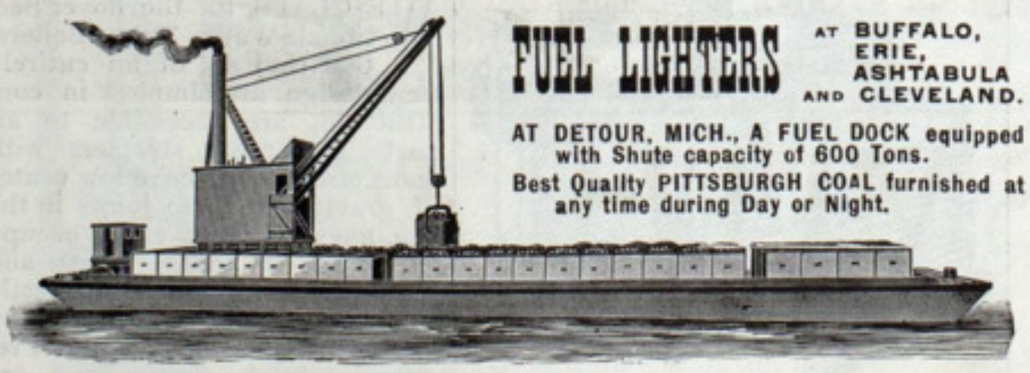

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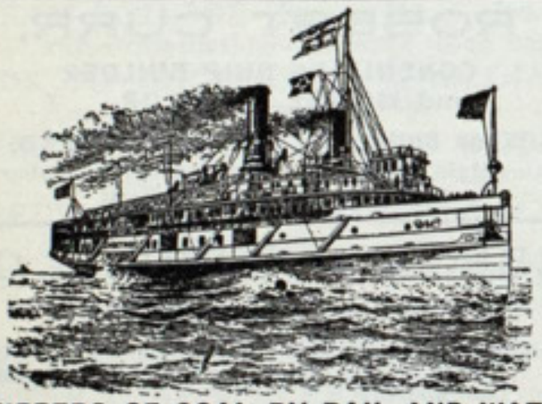

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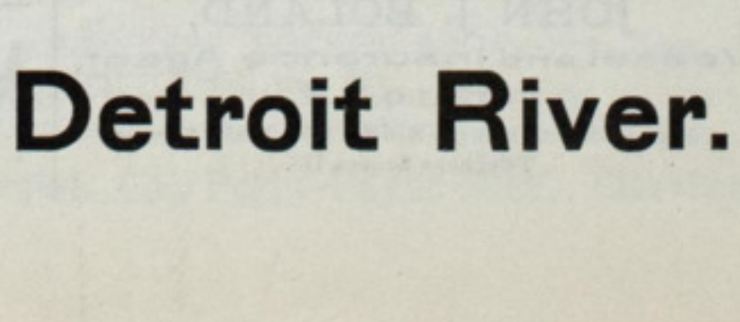

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Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER SHEET, WIRE AND ROD.

Hungerford Brass & Copper Co., U. T.....New York.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CORRESPONDENCE SCHOOLS—ENGINEERING AND NAVIGATION.

International Correspondence Schools.....Scranton, Pa.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Westinghouse Electric & Mnfg. Co. .....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Pelton Engineering Co.....Cleveland.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Giddings & Stevens.....Rockford, Ill.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FLUSHOMETERS.
Kenney, The Co.....New York.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE — ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
American Bridge Co.....New York.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.
Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.
Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.
Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Almy Water Tube Boiler Co..... 11
*American Bridge Co..... 26
American Line 7
American Ship Building Co..... 1
American Ship Windlass Co..... 2
American Steam Gauge Co..... 1
American Steel & Wire Co..... 1
Armstrong Cork Co..... 40
Ashton Valve Co..... 12
Atlantic Works 5
Atlantic Tube Co..... 7

Babcock & Wilcox Co..... 11
Baldt Anchor Co..... 9
Baker, Howard H. & Co..... 9
Bath Iron Works, Ltd..... 1
Bertram's Oil Polish Co..... 1
Bessemer Steamship Co..... 28
Bethlehem Steel Co..... 6
Big Four Railway..... 39
Blake, Geo. F., Mnfg. Co..... 9
*Bliss, John & Co..... 30
*Bloomsburg & Co., H..... 31
Boland, J. J..... 34
*Boston & Lockport Block Co..... 40
*Boyer Water Tube Boiler Co..... 31
Bourne-Fuller Co..... 12
Brown & Co..... 34
Brown Hoisting & Conveying Mach. Co. 2
Buffalo Dry Dock Co..... 28
Buffalo Forge Co..... 12
Bull & Co., A. H..... 34

Calvin Co., The..... 1
Castner, Curran & Bullitt..... 33
Champion Rivet Co..... 28
Chase Machine Co..... 6
Chicago Pneumatic Tool Co..... 3
Chicago Ship Building Co..... 2
*Cleveland Punch & Shear Works Co.. 30
C. C. C. & St. L. R. R..... 39
Conners, W. J..... 34
Continental Iron Works..... 2
Cory, Chas. & Son..... 10
*Craig Ship Building Co..... 30
Cramp, Wm., & Sons, S. & E. B. Co... 1
Crosby Steam Gage & Valve Co..... 12
Crowl, Samuel H..... 34
Curr, Robert 34

Dallett, Thos. H. & Co..... 28
Davidson, M. T..... 9
Dearborn Drug & Chemical Works..... 30
Dearing Water Tube Boiler Co..... 11
Delauney, Belleville & Co..... 27
Delaware River Iron S. B. & E. Works 5
Detroit Shipbuilding Co..... 1
Detroit Screw Works..... 11
Dixon, Jos., Crucible Co..... 9
Donnelly Salvage & Wrecking Co..... 32
Drake & Maytham..... 34
Drein, Thos. & Son..... 4
Duluth, South Shore & Atlantic Ry.... 39

Egan Co., The..... 7
Electric Boat Co..... 8
Electro-Dynamic Co. 1
Ellis Marine Plumbing Co..... 7
Elphicke, C. W. & Co..... 34
Elwell-Parker Electric Co..... 2
Erie & Western Trans. Co..... 32

Falls Hollow Staybolt Co..... 4
Farrar & Trefts..... 5
Fay & Egan Co., J. A..... 7
Fletcher, W. & A. Co..... 4
Fore River Engine Co..... 5
Fogg, M. W..... 31

Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated..... 31
General Electric Co..... 12
Gibbs & Joys..... 34
Giddings & Stevens..... 31
Gilchrist, Albert J..... 34
Goulder, Holding & Masten..... 34
Graham, James & Co..... 33
Great Lakes Register..... 7

Hall & Root..... 34
Hanna, M. A. & Co..... 32
Hardy, John B..... 4
Harlan & Hollingsworth Co., The..... 5
Hawgood & Moore..... 34
Helios-Upton Co..... 6
Helm, D. T. & Co..... 34
Herriman, F. D..... 7
Hodge, S. F. & Co..... 8
Holmes, Samuel..... 34
Hoyt, Dustin & Kelley..... 34
Hungerford Brass & Copper Co., U. T.. 3
Hunt, Robert W. & Co..... 34
Hutchinson & Co..... 34
Hyde Windlass Co..... 40

Ingersoll-Sergeant Drill Co..... 32
International Anchor Co..... 9
International Correspondence Schools..... 32
International Navigation Co..... 7
Iowa Iron Works..... 5

Jenkins Brothers.....10-12
Jenks Ship Building Co..... 39

Kahnweiler's Sons, David..... 4
Katzenstein, L. & Co..... 4
*Kenney Co., The..... 27
Keith, J. G. & Co..... 34
Keystone Engine & Machine Works.... 6
Kingsford Foundry & Machine Works.. 30

Lane & DeGroot..... 4
*Learmonth, Robert..... 30
Lebanon Chain Works..... 5
Lidgerwood Mfg. Co..... 6
L. S. & M. S. Ry..... 39

McMyler Mfg. Co..... 4
*Magnolia Metal Co..... 1
MacKinnon Mfg. Co..... 8
Mair, John & Son..... 6
Marine Iron Co..... 4
Marine Supply Co..... 31
Martin-Barriss Co..... 9
Maryland Steel Co..... 5
Miller, Walter..... 9
Mitchell & Co..... 34
Moffat & O'Brien..... 34
Monongahela Iron & Steel Co..... 3
*Moran Bros. Co..... 39
Morse Iron Works & Dry Dock Co..... 4
Morse, Williams & Co..... 9
Mott Iron Works, J. L..... 10

Neafie & Levy Co..... 5
*Newhall Chain Forge & Iron Co..... 30
Newport News Ship Building & Dry Dock Co..... 5
New Doty Mfg. Co..... 12
Niles Tool Works Co..... 3
Nixon, Lewis..... 5
North River Iron Works..... 5

Olds Motor Works..... 8
Osborne & Co., F. H..... 34

Page Bros. & Co..... 3
Parker, A. A. & B. W..... 32
Pauly, H. J..... 34
Peck, Chas. E. & W. F..... 7
Pelton Engineering Co..... 40
*Penberthy Injector Co..... 39
Phenix Metallic Packing Co..... 8
Philadelphia Pneumatic Tool Co..... 10
Phosphor Bronze Smelting Co., Ltd..... 9
Pickands, Mather & Co..... 32
Pinney, Orestes C..... 34
Pittsburg Coal Co..... 33
Pittsbu gh Testing Laboratory, Ltd..... 34
Playfair's Barge & Tug Line..... 40
Powell, Ambrose V..... 34
Pusey & Jones Co..... 5

Queen City Engineering Co..... 10

Red Star Line..... 7
Richardson, W. C..... 34
Risdon Iron Works..... 5
*Ritchie & Sons, E. S..... 30
Roach's Ship Yard..... 5
Roberts Water Tube Boiler Co..... 11
Rochester & Pittsburgh Coal & Iron Co. 33
*Roebling's, John A. Sons Co..... 40
Rushmore Dynamo Works..... 6

Safety Car Heating & Lighting Co..... 31
Sands, Alfred B. & Son..... 10
Scherzer Rolling Lift Bridge Co..... 6
Scott Co., W. L..... 32
See, Horace..... 34
Shelby Steel Tube Co..... 29
Sheriffs Mfg. Co..... 10
*Signal & Control Co..... 7
Simpson, Geo. A..... 28
Smith, Edward & Co..... 1
Smith, Stanley B. & Co..... 33
Stratford Oakum Co., Geo..... 32
Standard Chain Co..... 10
Standard Oil Co..... 31
Standard Releasing Hook Co..... 4
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U. S. Metallic Packing Co..... 40

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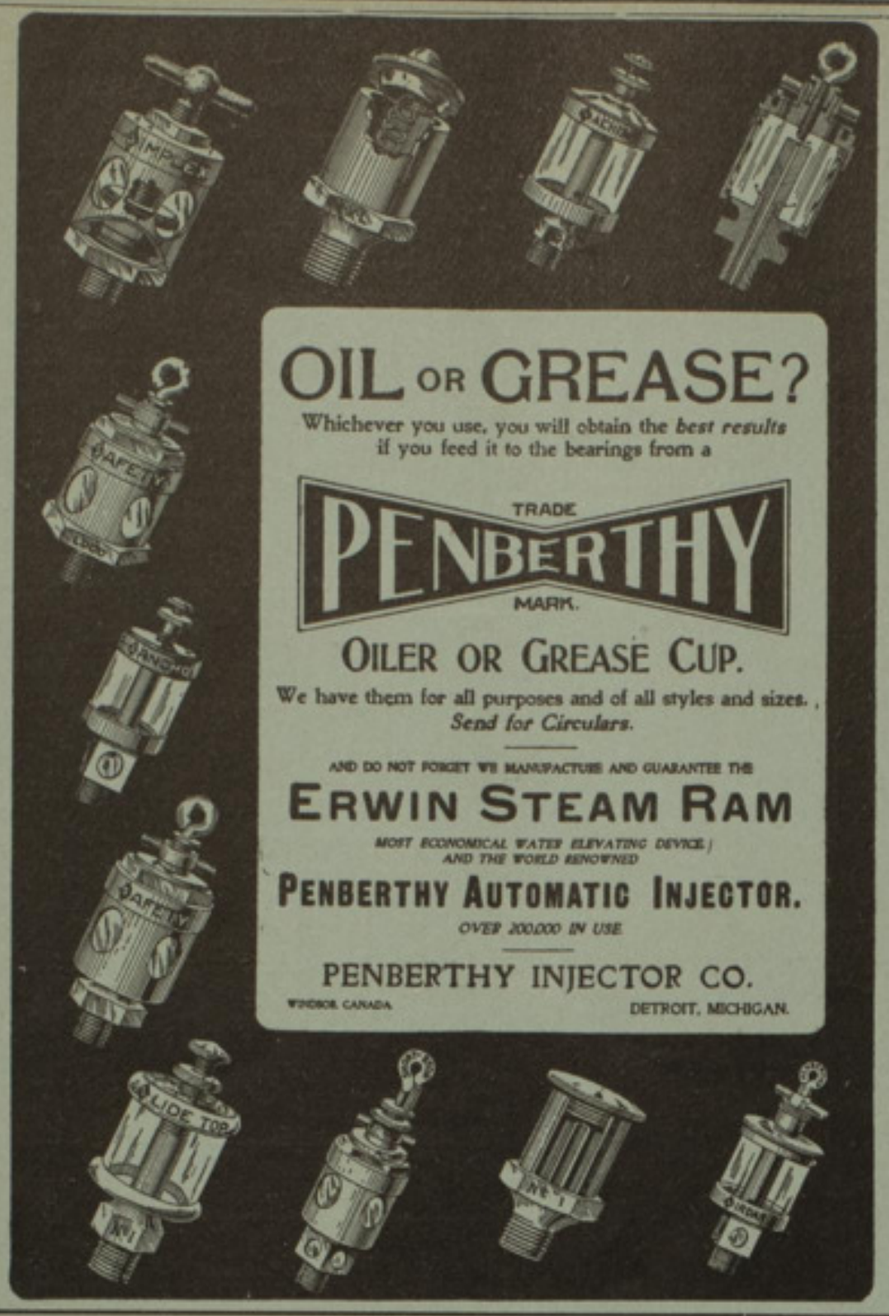
Warren Webster & Co..... 10
Westinghouse Electric & Mgf. Co..... 6
White, Johnson, McCaslin & Cannon..... 34
Willard, Chas. P. & Co..... 8
Wilson, Thomas..... 34
Wilson & Silsby..... 6
Wolff & Zwicker Iron Works..... 5
Wood, W. J..... 34
*Wood & Co., R. D..... 30
Woods Machine Co., S. A..... 8
Worthington, Henry R..... 9
Wright, Herbert & Co..... 34

Youghiogheny & Lehigh Coal Co..... 33



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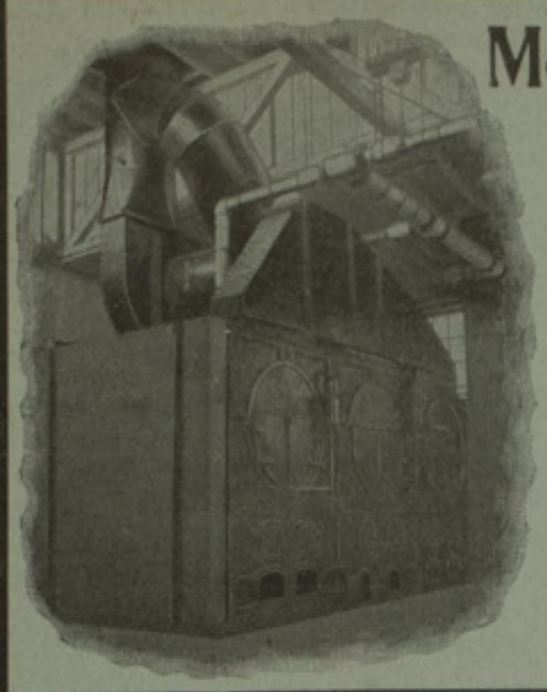

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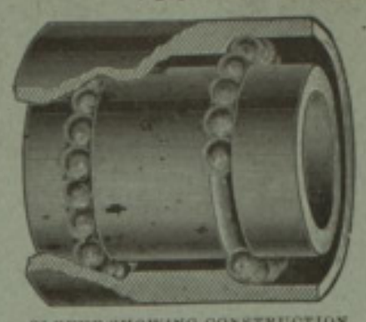

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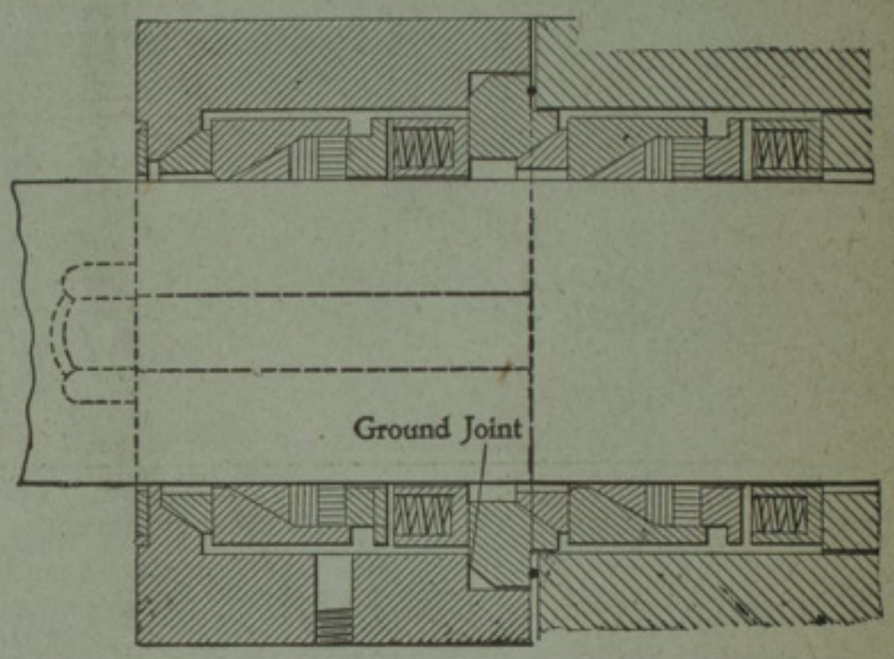

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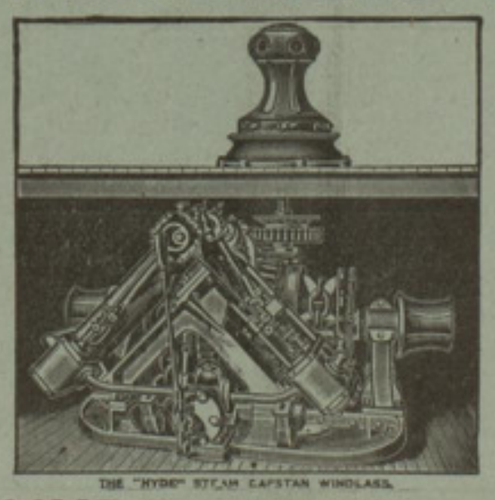

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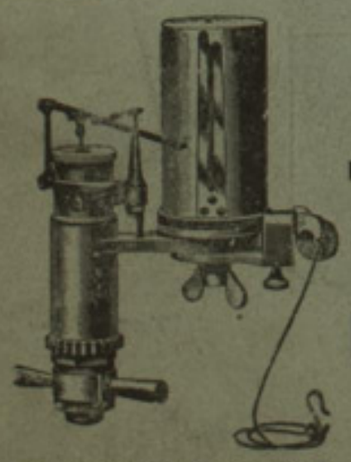

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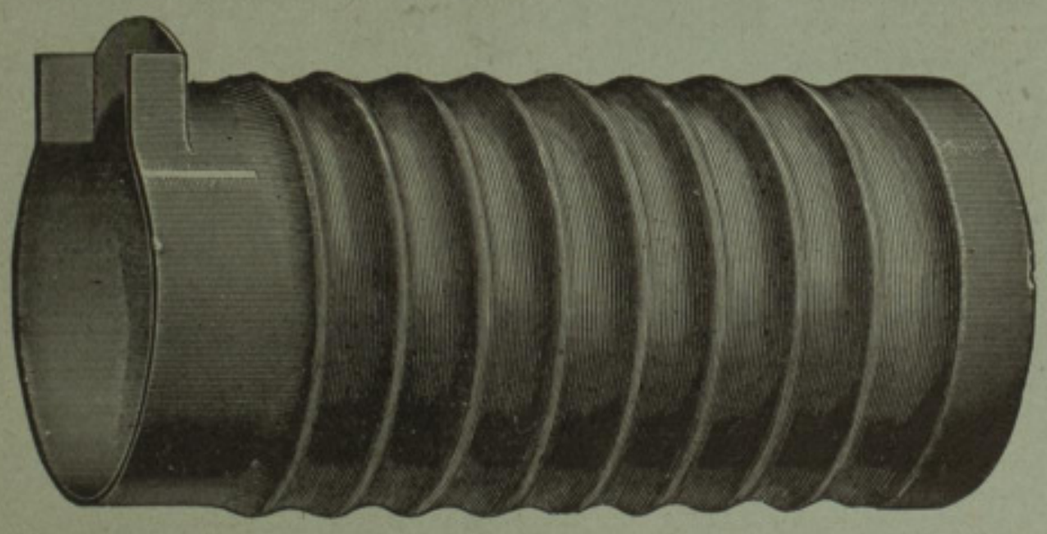

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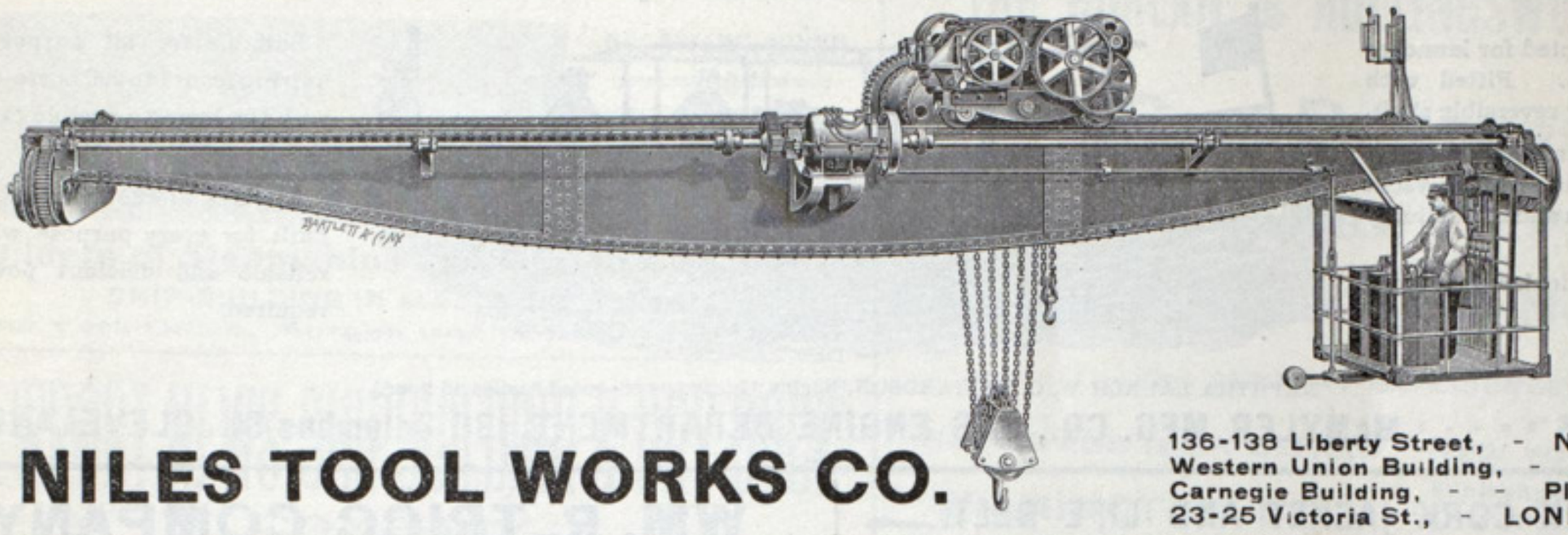

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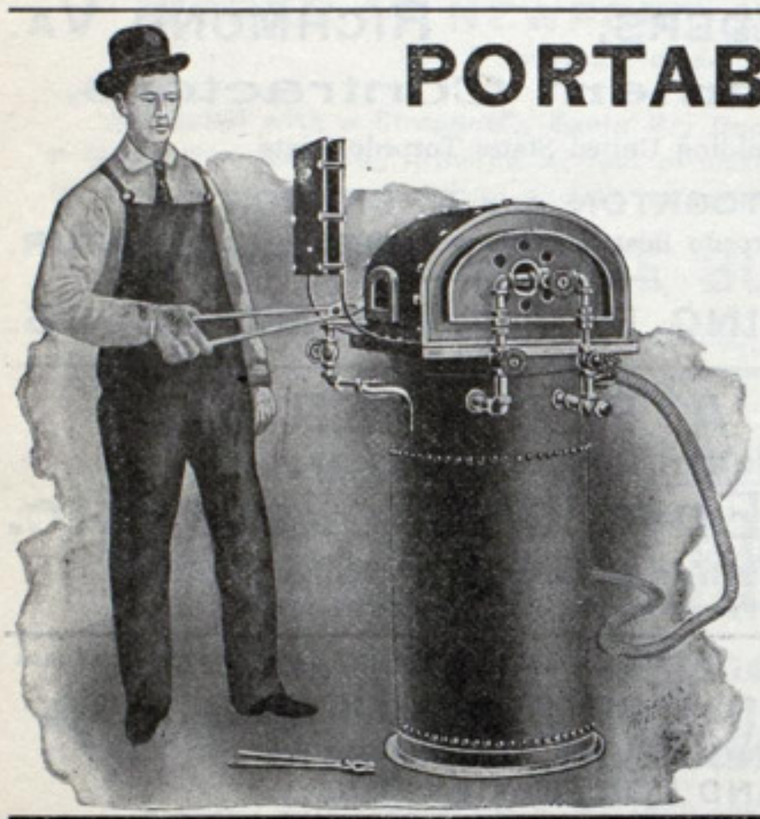

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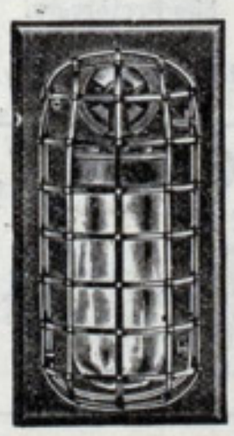

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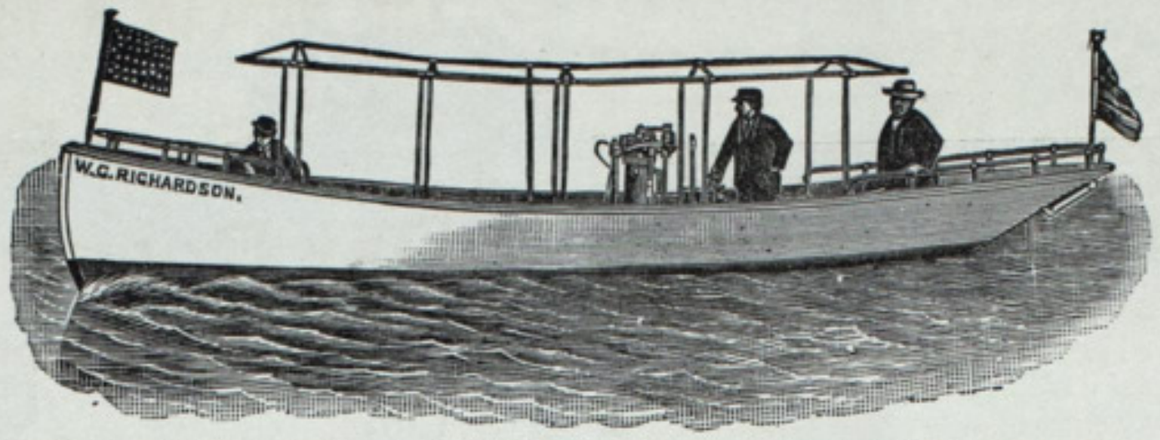

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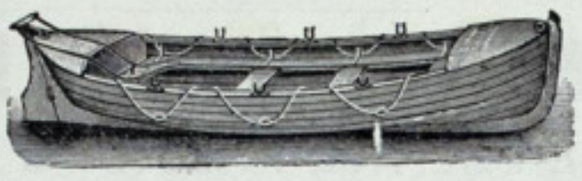

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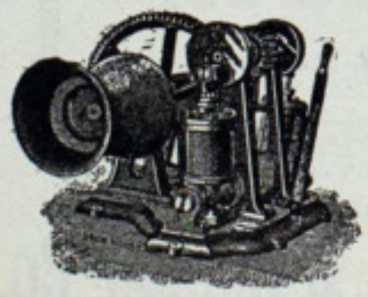

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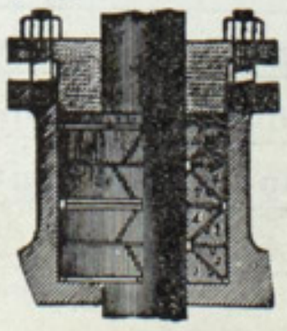

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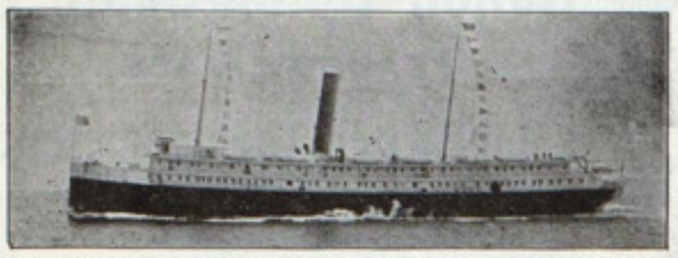

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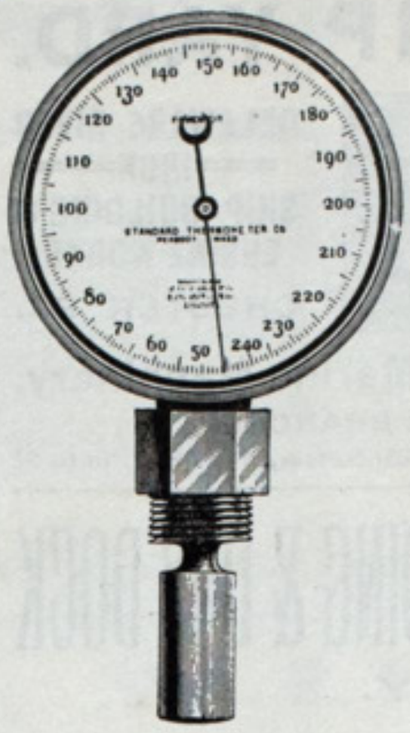

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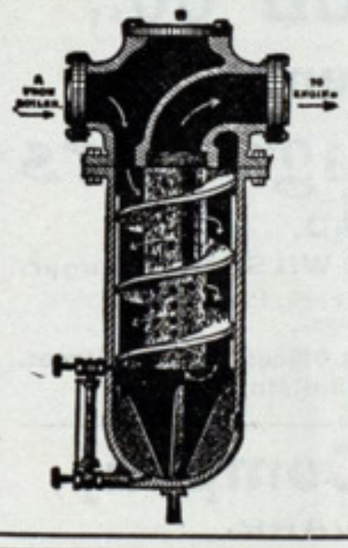

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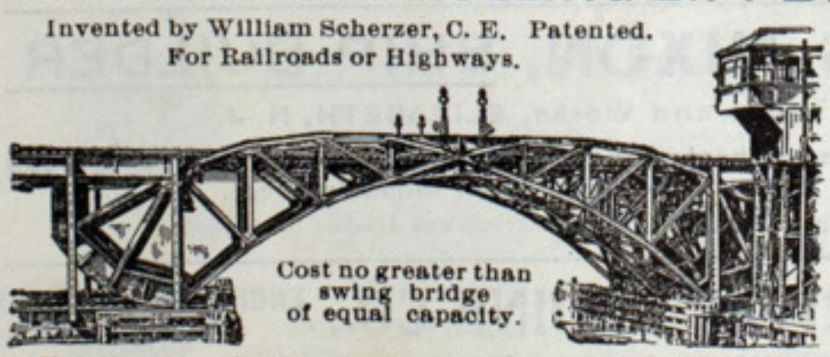

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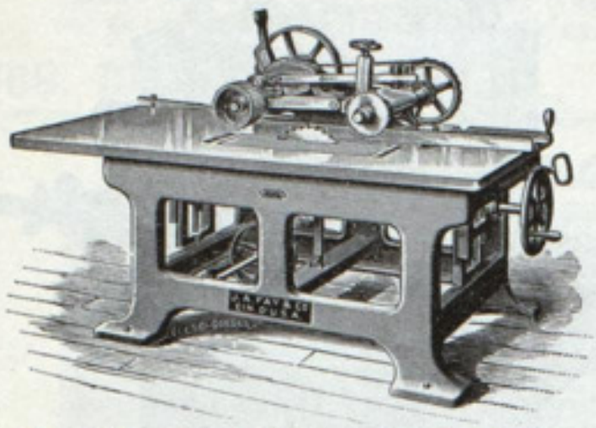

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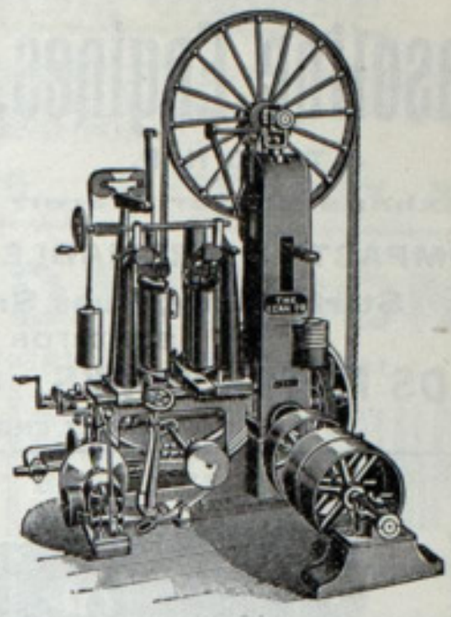

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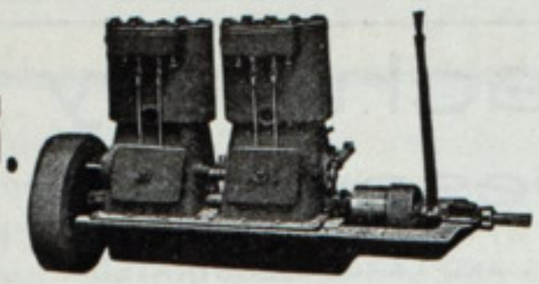

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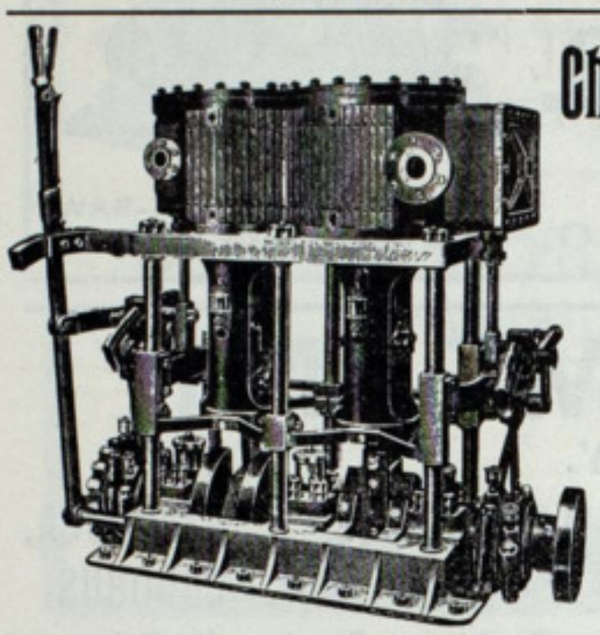

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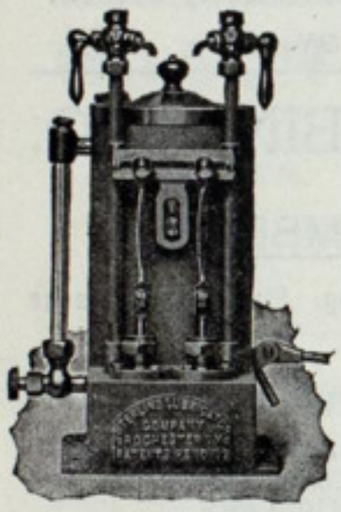

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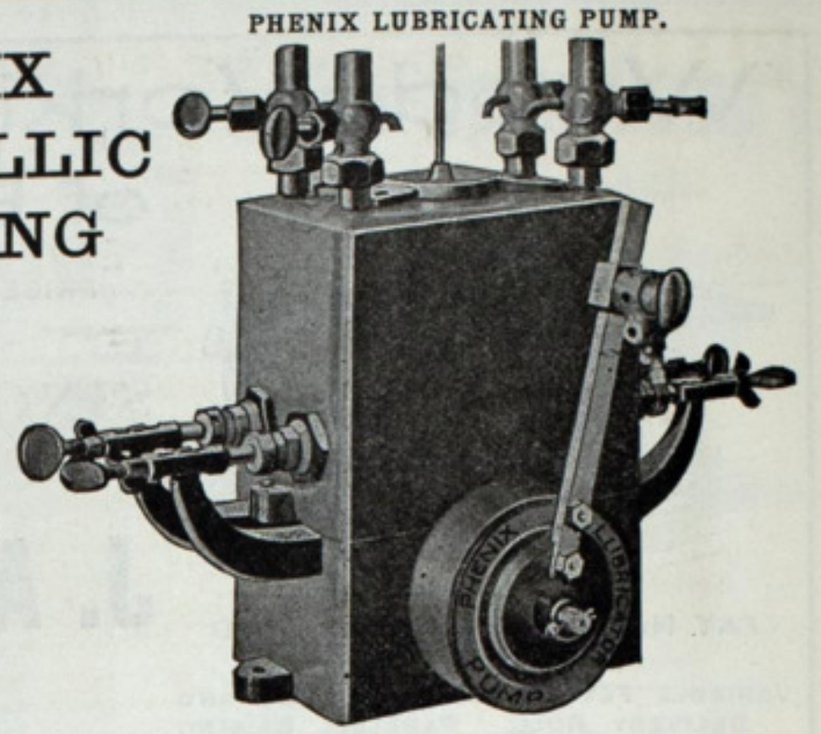

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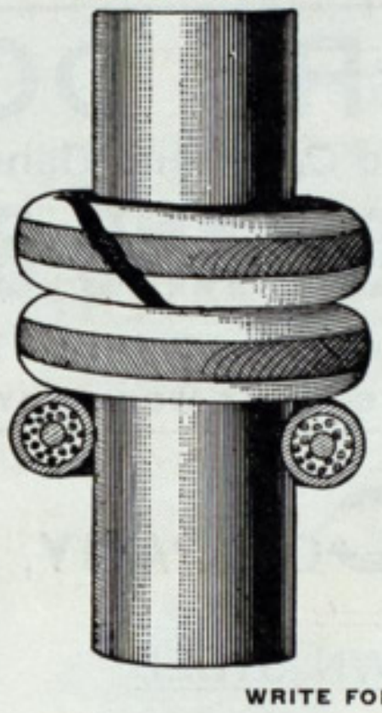
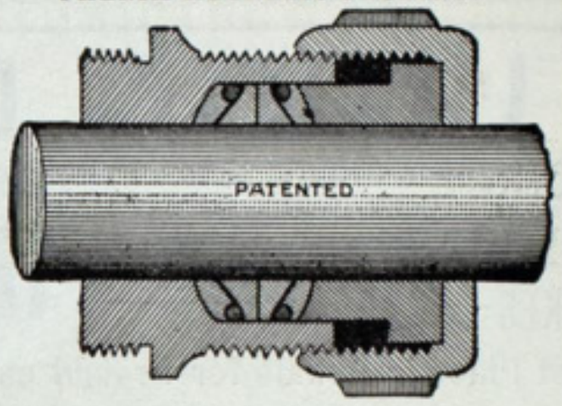


PHENIX METALLIC PACKING.



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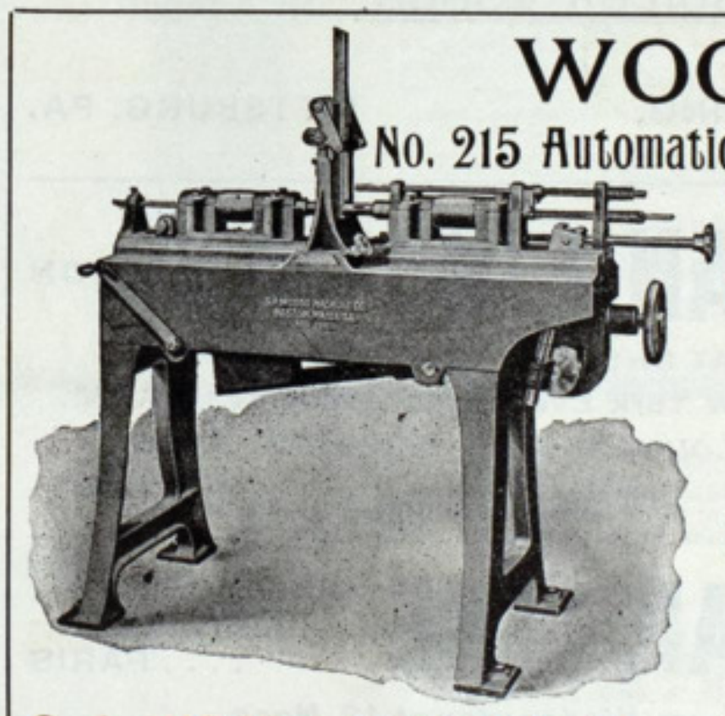

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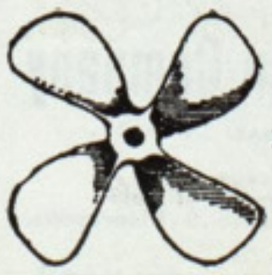

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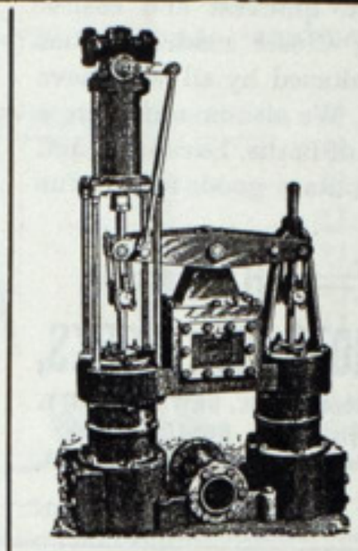

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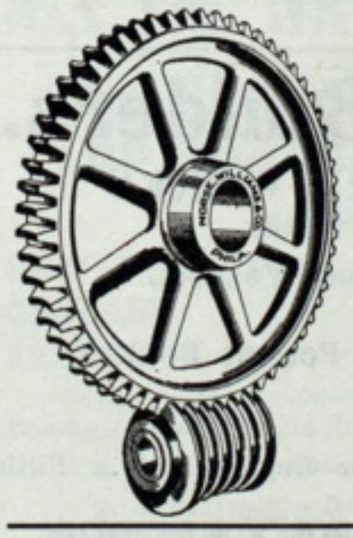

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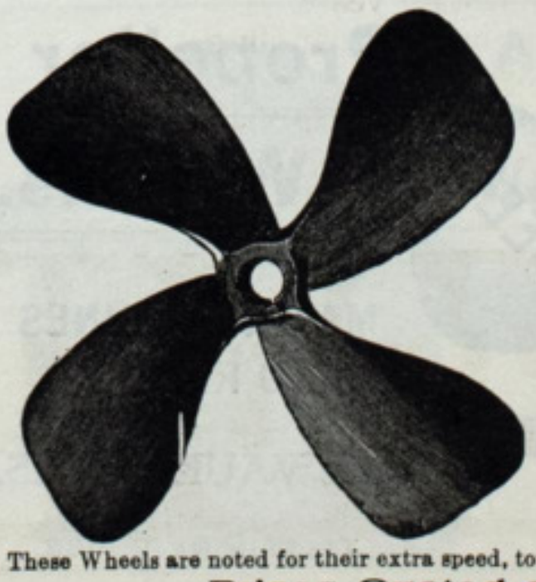

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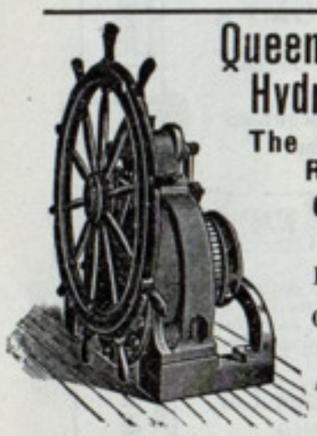

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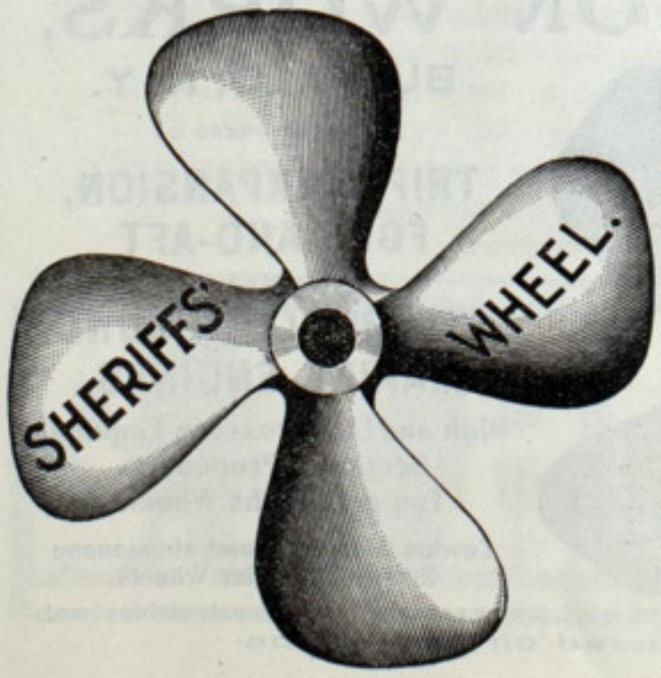

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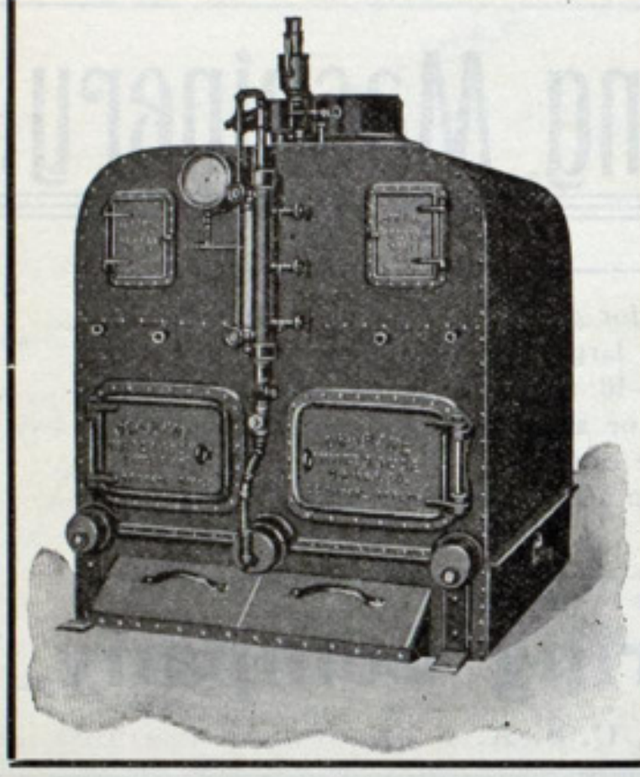

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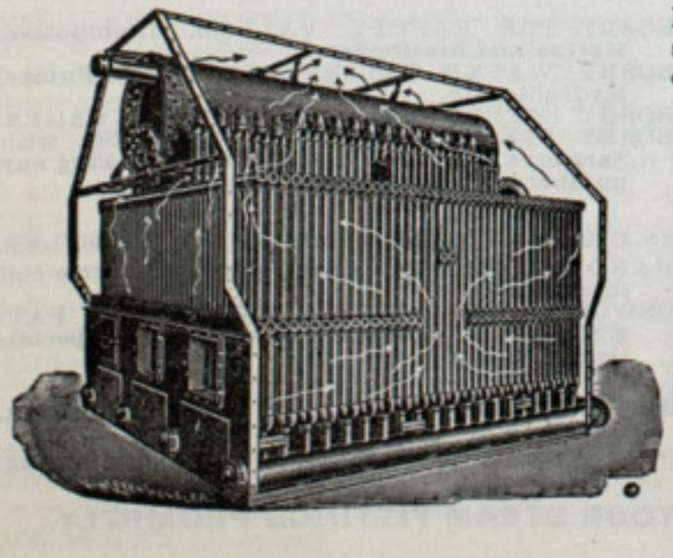

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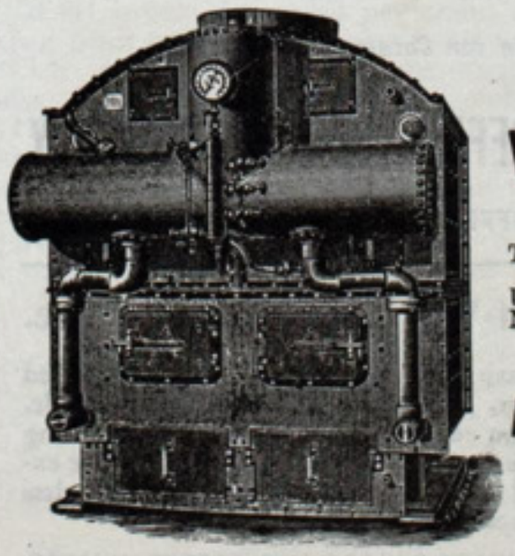

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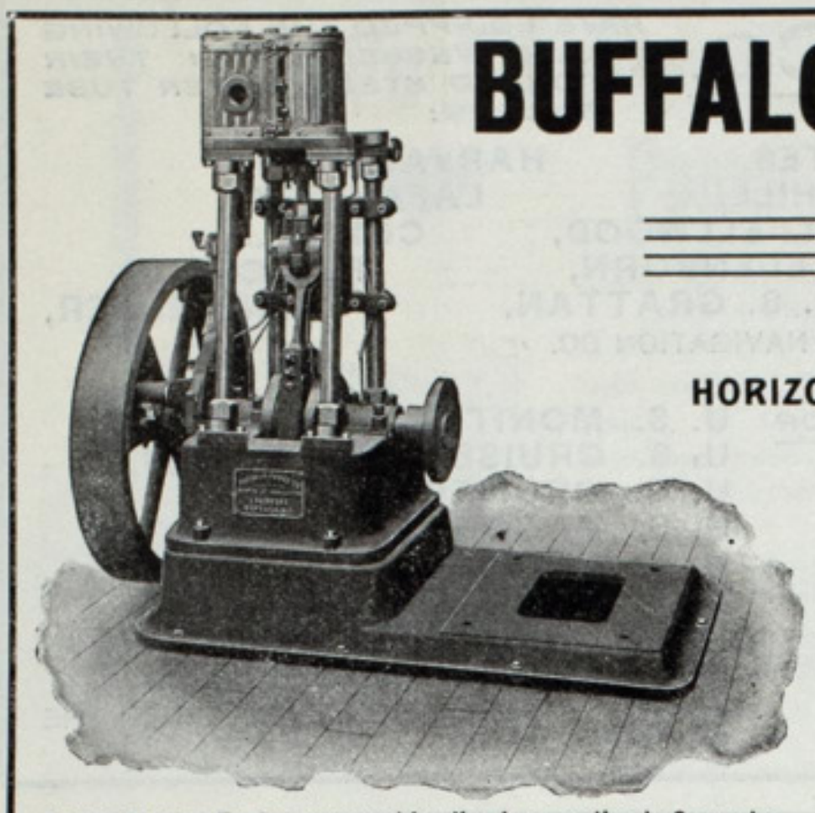

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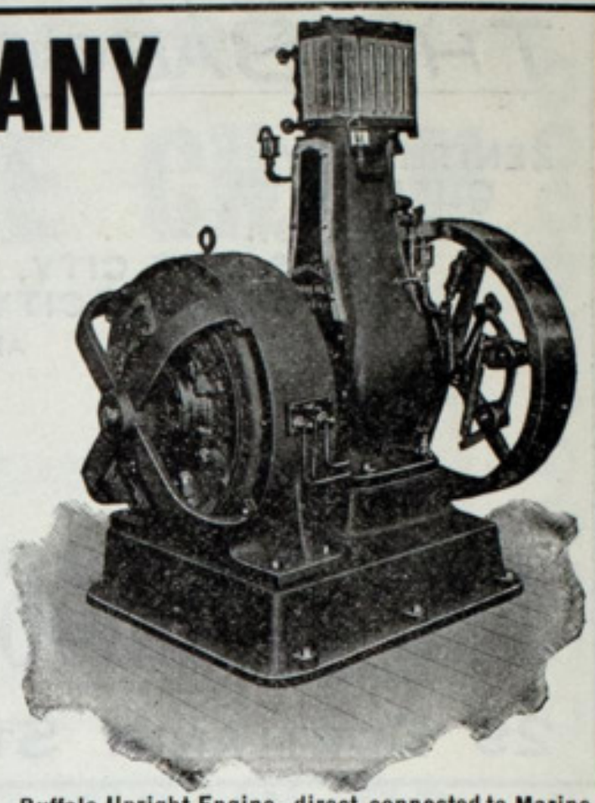

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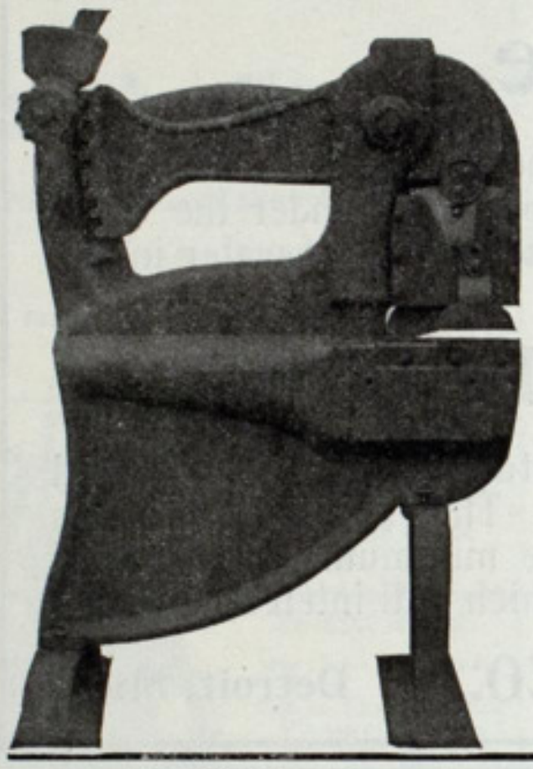

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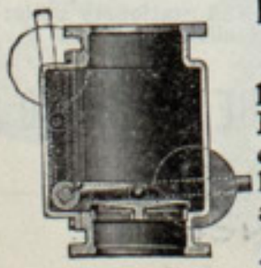

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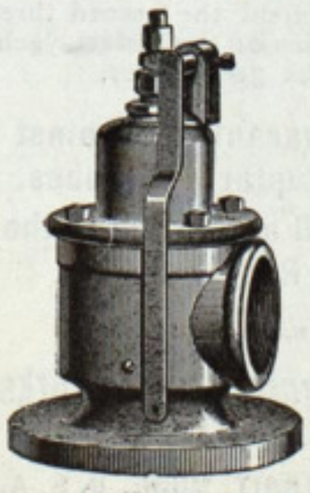

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